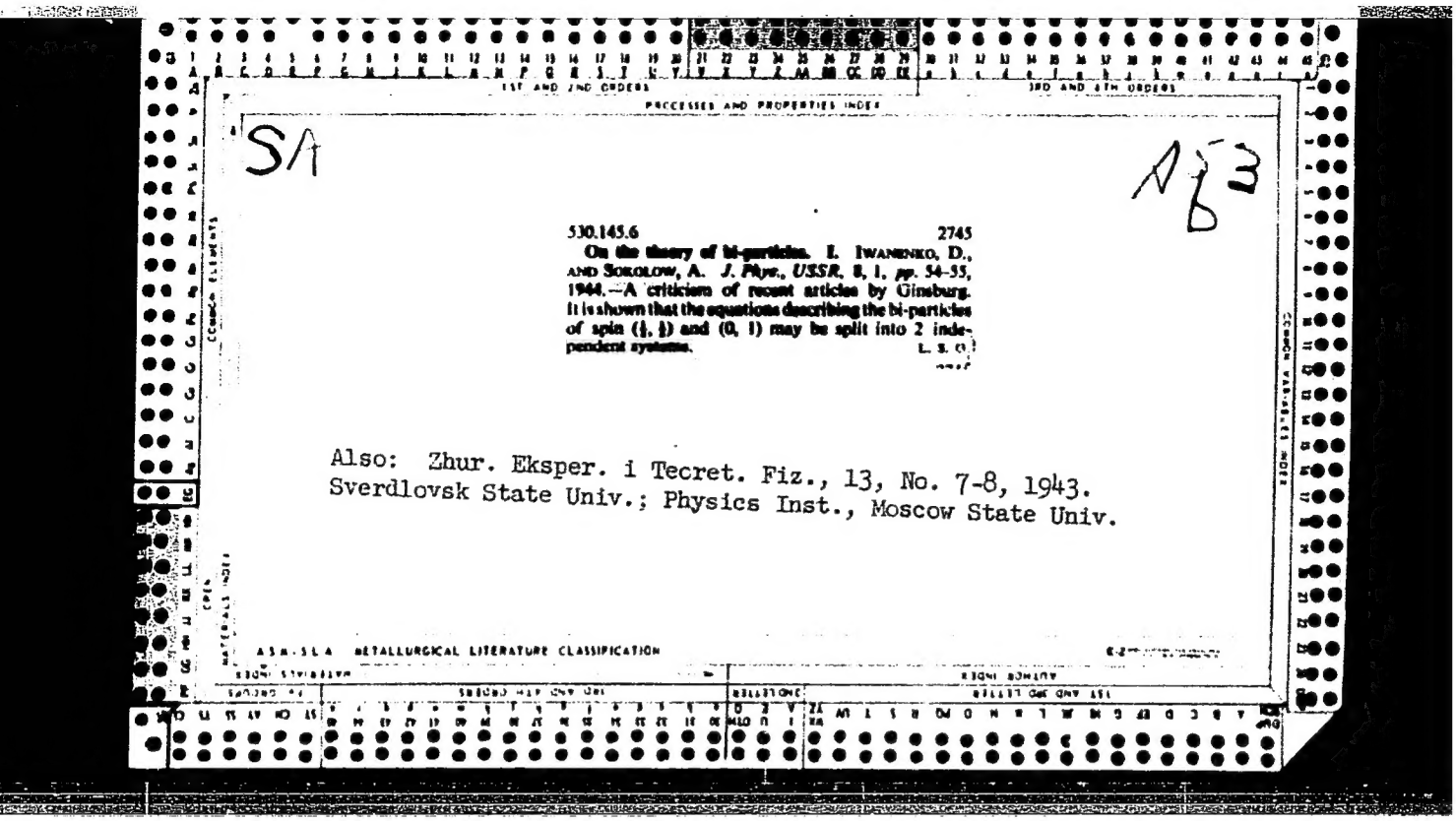
SOKOLOV, A.

"On the Dipolness of Mesons and the Difficulties of the Proca Theory," Zhur Eksper. i. Teoret. Fiz., 12, No. 10, 1942.

State University, Sverdlovsk.



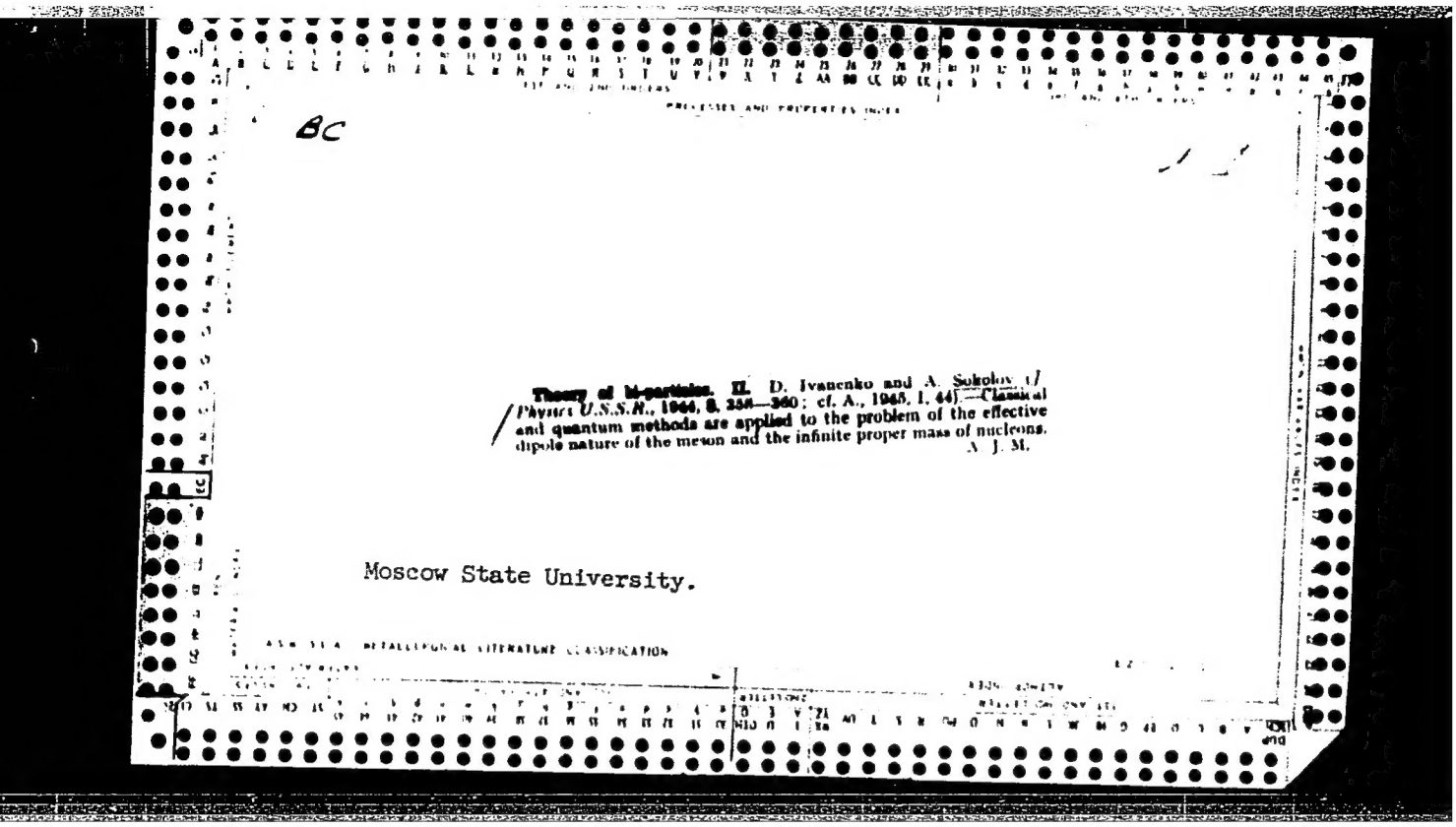
SA

AB3

530.145.6 2745

On the theory of bi-particles. I. IVANENKO, D., AND SOKOLOW, A. *J. Phys., USSR*, 8, 1, pp. 54-55, 1944.—A criticism of recent articles by Ginsburg. It is shown that the equations describing the bi-particles of spin (½, ½) and (0, 1) may be split into 2 independent systems. L. S. O.

Also: Zhur. Eksper. i Tecret. Fiz., 13, No. 7-8, 1943.
Sverdlovsk State Univ.; Physics Inst., Moscow State Univ.



BC

Theory of ~~**M**~~**-particles. II.** D. Ivanenko and A. Sokolov. [/ *Physics U.S.S.R.*, 1944, 8, 358—360; cf. A., 1945, I, 44.] — Classical and quantum methods are applied to the problem of the effective dipole nature of the meson and the infinite proper mass of nucleons. A. J. M.

Moscow State University.

SOKOLOV, A.

"On the Theory of Bi-Particles, II," Zhur. Eksper. i Teoret. Fiz., 14, No. 10-11, 1944.

Physics Inst., Moscow State Univ.; Sverdlovsk State Pedagogical Inst.

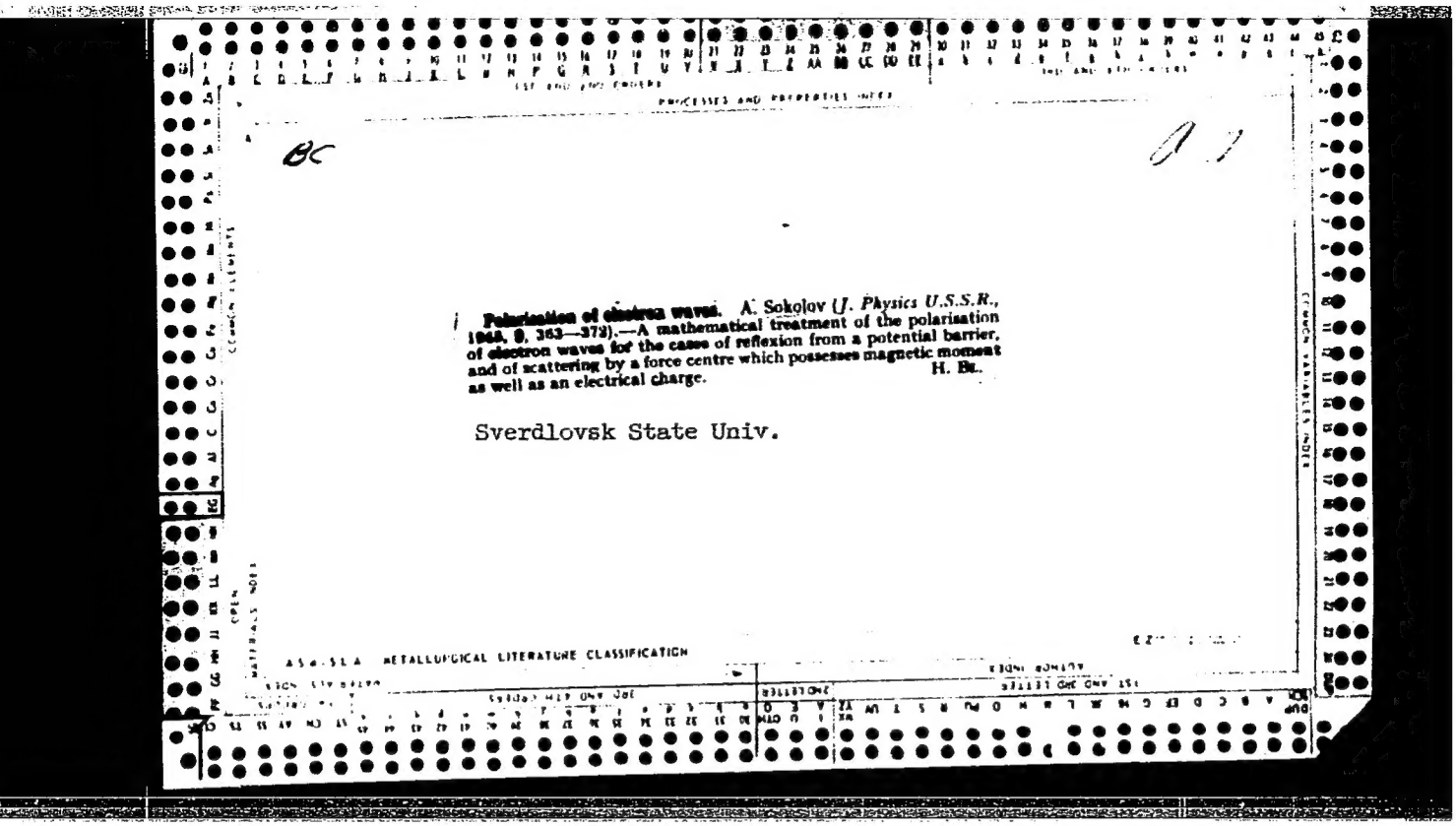
SOKOLOV, A.

1-4E4C

Sokolow, A. On the polarization of electron waves. Acad. Sci. USSR. J. Phys. 9, 363-372 (1945). [MF 15122]

The polarization of electron waves is investigated for the cases of reflection from a potential barrier and of scattering by a center of force. For the two-dimensional problem of the reflection and refraction of plane electron waves by a step-function potential whose magnitude is small compared to the kinetic energy of the electron, it is shown that both the reflected and the refracted waves are unpolarized if the incident wave is unpolarized. For the problem of scattering by a center of force, a general formula is first derived by using Dirac's time-dependent perturbation theory and it is then applied to the case where the force center possesses electric charge and magnetic moment. Since the existence of polarization can only be detected by analysis of the scattered waves by another scattering process, the distributions for double scattering by two centers of force are calculated. It is shown that in the first approximation polarization terms occur only if the scattering centers possess both electric and magnetic moment, neither the charge or the moment by itself being sufficient. When the calculation is carried out to the second approximation, pure Coulomb interaction gives rise to polarization effects and the formula obtained here coincides with that obtained by Mott previously in a different way. *S. Kusaka* (Princeton, N. J.).

Source: Mathematical Reviews, Vol No.

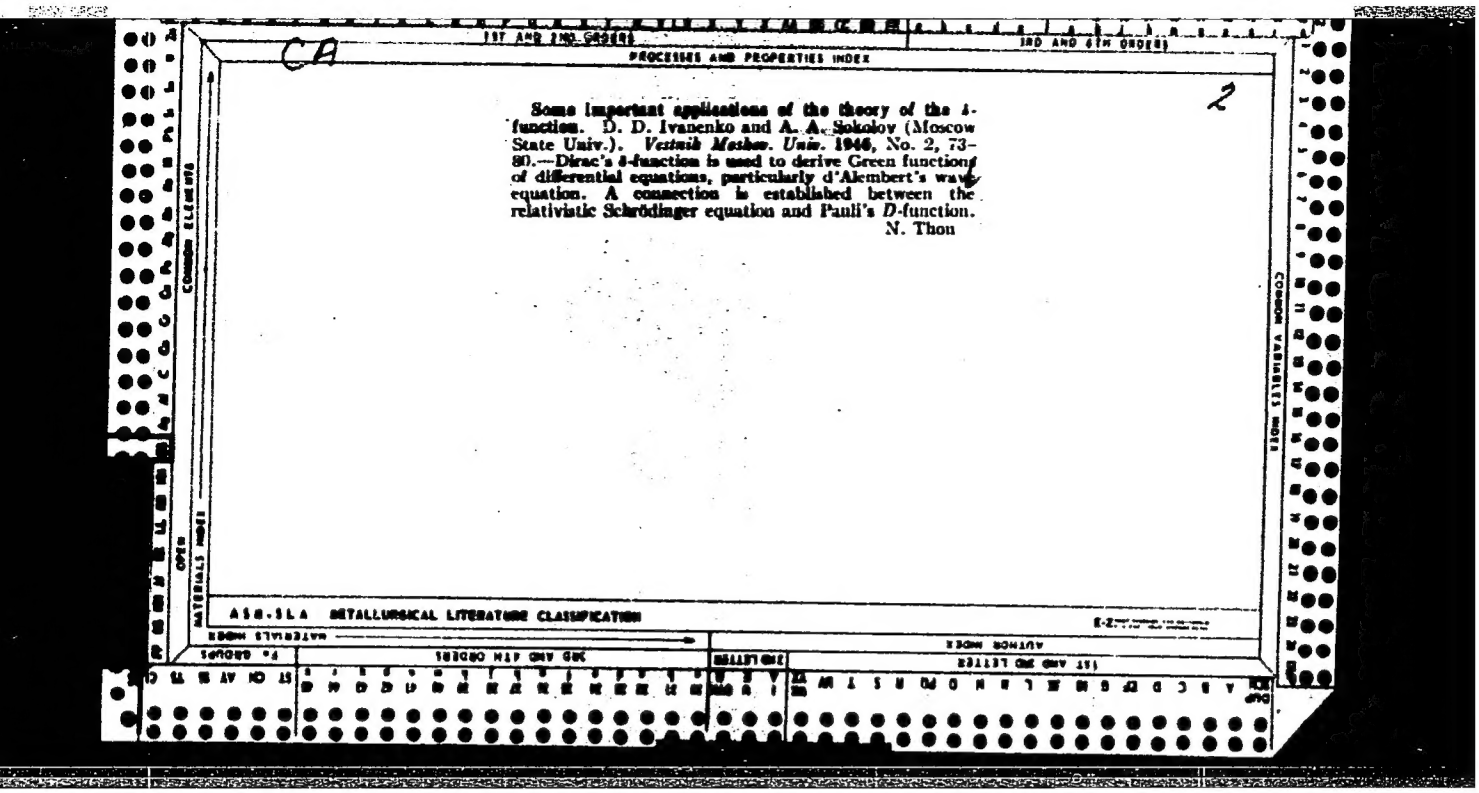


BC

A 1

Polarisation of electron waves. A. Sokolov (*J. Physics U.S.S.R.*, 1943, **8**, 363—372).—A mathematical treatment of the polarisation of electron waves for the cases of reflexion from a potential barrier, and of scattering by a force centre which possesses magnetic moment as well as an electrical charge. H. Bl.

Sverdlovsk State Univ.



CA

PROCESSES AND PROPERTIES INDEX

2

Some important applications of the theory of the δ-function. D. D. Ivanenko and A. A. Sokolov (Moscow State Univ.). *Vestnik Moskov. Univ.* **1946**, No. 2, 73–80.—Dirac's δ-function is used to derive Green functions of differential equations, particularly d'Alembert's wave equation. A connection is established between the relativistic Schrödinger equation and Pauli's D-function.
N. Thon

SOKOLOV, A.A.

309

Sokolow, A. A. On the classical theory of elementary particles (point electron). Vestnik Moskov. Univ. 1947, no. 2, 33–48 (1947). (Russian. English summary)

The equation of motion of a classical point electron, including the radiation-reaction term, is derived by a procedure essentially the same as that used by P. A. M. Dirac [Proc. Roy. Soc. London. Ser. A. 167, 148–169 (1938)] and G. Wentzel [Z. Physik 86, 479–494 (1933)]. The author does not refer to the recent and more profound analysis of this procedure by J. A. Wheeler and R. P. Feynman [Rev. Modern Physics 17, 157–181 (1945)]. He includes a brief discussion of the problem of fixing boundary conditions so as to exclude the nonphysical self-accelerating solutions of the equation of motion, and also derives the formulae for the emission and scattering of light by an electron.

F. J. Dyson (London).

Source: Mathematical Reviews, Vol 10 No. 7

SOKOLOV, A. A.

105. A. A. Sokolov, On the solution of the nonlinear hydromechanical equation by the perturbation method (in Russian with English summary), Vestnik Moskov. Univ. 1947, no. 4, 77-82 (1947).

The author treats the equation describing the (adiabatic) motion of a gas in a tube with one fixed end and with a freely moving piston of mass M. The differential equation reads: $\xi_{tt} = c^2(\xi_x)^{\gamma-1}\xi_{xx}$. The initial conditions are: $\xi_t = 0$, $\xi_x =$ constant for $t = 0$, $0 \leq x \leq a$. The boundary conditions are: $\xi = 0$ for $x = 0$, $\xi_{tt} = (\mu/a)\xi_x$ for $x = a$. Here ξ is the amplitude x and t Lagrangian variables, c the acoustic speed for the (constant) initial state, γ the ratio of specific heats, a the initial distance from the piston to the fixed end, $\mu = m/(\gamma M)$, m being the mass of the gas [cf. A. E. F. Love and F. B. Pidduck, Philos. Trans. Roy. Soc. London. Ser. A. 222, 168-226 (1922)]. Assuming an expansion in powers of μ and neglecting μ^2 and terms of higher order, the author obtains an approximate solution of the form $\xi = \xi_1(t)\xi_2(x) + u$. Here $\xi_2 = x - (\mu/6)(x - x^3/a^2) + \ldots$; ξ_1 is determined by the relation

$$\int_1^{\xi_1} \xi_1^{(\gamma-1)/2}(\xi_1^{\gamma-1} - 1)^{-1}d\xi_1 = (2ck)^{1/2}t,$$

where $v = 1/(\gamma - 1)$, $k = c^2a^{-2}\mu[1 - \frac{3}{4}(1 + v)\mu/(2v)]$. For small values of t, $\xi_1 = 1 + kt^2/2$; for large values of t, $\xi_1 \approx (2ck)^{1/4}t$. The formulas for the additional term u are too complicated to be reproduced here. This term represents a standing wave which disappears as $t \to \infty$.

L. Bers, USA

1956

CA

3

Metastable combinations of elemental particles. D.-D. Ivanenko and A. A. Sokolov. *Vestnik Moskov. Univ.* 1947, No. 6, 3-7.—Cross sections are calcd. for the combination of a meson with an electron of opposite sign to form a metastable "planetary" system at various velocities v of the incident particle. When $v < \alpha c$ (where α is the fine-structure const. and c is the velocity of light), the cross section is comparatively high; when $v = \alpha c$, formation of this system and annihilation are equally probable. For $v > \alpha c$, annihilation is more probable. The life of such a system is calcd. to be $\sim 5 \times 10^{-19}$ sec. C. F.

Sokolov, A. A.

Ivanenko, D. D., and Sokolov, A. A. Quantum theory of gravitation. Vestnik Moskov. Univ. 1947, no. 8, 103–113 (1947). (Russian)

The paper begins with a simplified derivation of the equations of M. Fierz and W. Pauli [Proc. Roy. Soc. London. Ser. A. 173, 211–232 (1939); these Rev. 1, 190] describing a quantized field of tensor character. Such a field can be identified with the Einstein gravitational field, in a weak-field approximation neglecting quadratic terms in the field equations. The quanta of the field, "gravitons," are particles of spin two. The intensity of gravitational radiation from a moving source of the field is calculated by perturbation theory, and is found to agree with the classically calculated intensity in the low-frequency limit. Finally, there is considered the problem of a quantized scalar field acting as the source of the gravitational field; in this case there exists a process of annihilation of a scalar particle and anti-particle, with the emission of two gravitons; also there exists an inverse process of creation. The cross-section for the annihilation process is found to be of the order of the square of the gravitational radius of a scalar particle.

F. J. Dyson (London).

Source: Mathematical Reviews, Vol 10 No. 7

SOKOLOV, A.

USSR/Nuclear Physics - Particles, Elementary Dec 47
Nuclear Physics - Stability

"Metastable Compounds of Elementary Particles," D. Ivanenko, Phys Inst, Moscow State U imeni M. V. Lomonosov; A. Sokolov, Agr Acad imeni K. A. Timiryazev, 3½ pp

"Dok Akad Nauk SSSR, Nova Ser" Vol LVIII, No 7

Discusses systems whose stability is result of electric forces. Explains reliability of formation of atom type atoms from two elementary particles. Submitted by Academician S. I. Vavilov, 24 Jul 1947.

PA 60T81

SOKOLOV, A. A.

Sokolov, A. A. - "Toward a theory of the luminous electron," Vestnik. Mosk. un-ta, 1948, No. 11, p. 95-101 -- Bibliog: p. 101

So: U- 3566, 15 March 53, (Letopis 'Zhurnal ! nykh Statey, No. 13, 1949)

SOKOLOV, A.

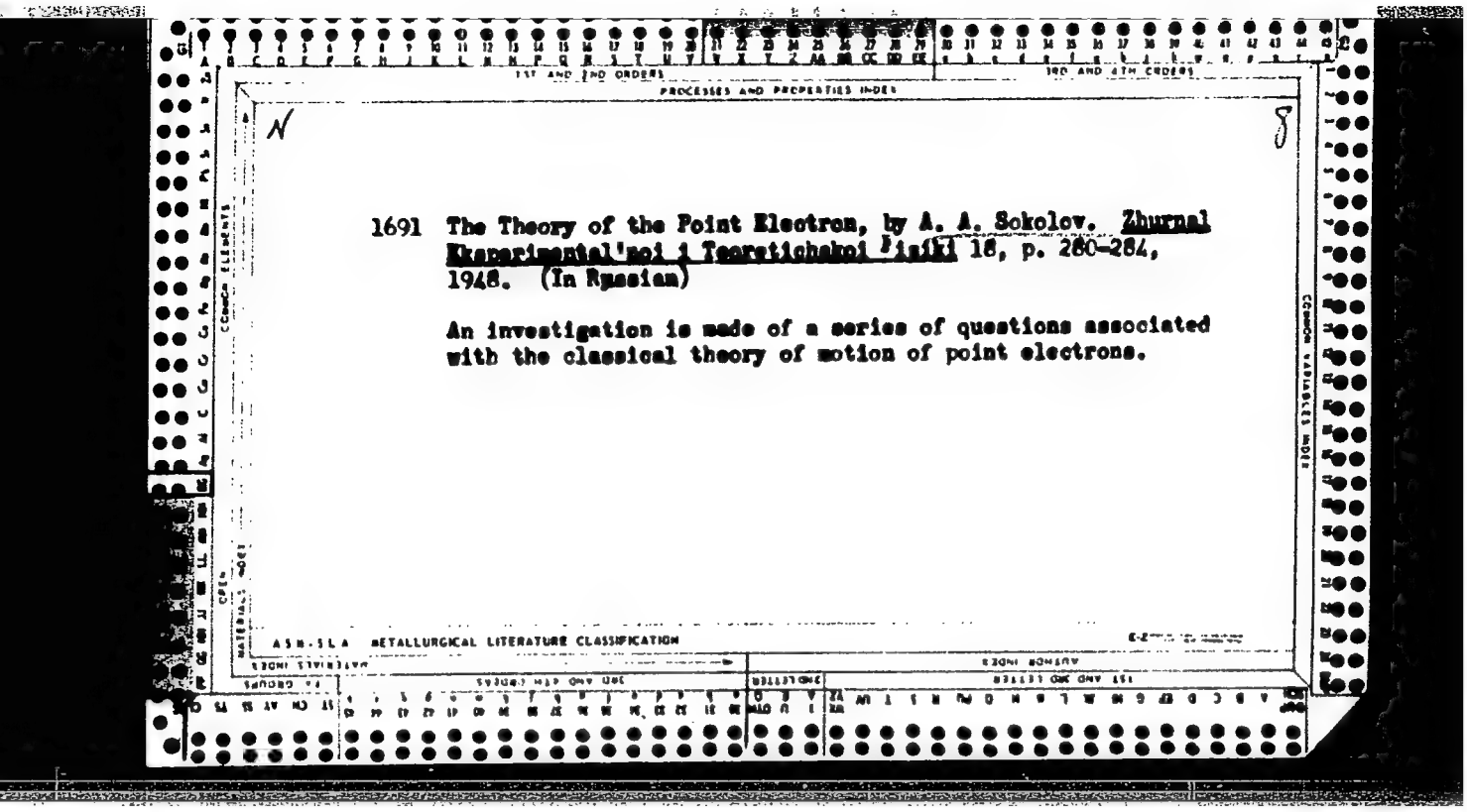
USSR/Nuclear Physics - Electrons, Emission of Sep/Oct 48
Nuclear Physics - Electrons, Acceleration of

"Theory of the Luminescent Electron," D. Ivanenko, A. Sokolov, 1/8 p

"Iz Ak Nauk SSSR, Ser Fiz" Vol XII, No 5

Describes results of authors' work on calculating the emission spectra of electrons in activators (A. Sokolov, "Vest Moskov U" 4, 77, 1947; D. Ivanenko and A. Sokolov, "Dok Ak Nauk SSSR" 58, 1948). [This is a complete translation.]

PA 19/49T107



1691 The Theory of the Point Electron, by A. A. Sokolov. Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki 18, p. 280-284, 1948. (In Russian)

An investigation is made of a series of questions associated with the classical theory of motion of point electrons.

537.122

1889. On the theory of the "luminous" electron. IVANENKO, D. AND SOKOLOV, A. *Dokl. Akad. Nauk. SSSR*, **59** (*No.* 9) 1551–4 (1948) *In Russian.*—A full theory of the e.m. radiation from electrons accelerated to $\sim 10^8$ eV in betatrons is given. As the intensities of higher multipoles of the order n are obtained by multiplying the dipole intensity by n, consideration of non-relativistic velocities may simply be based on dipole radiation. The ultra-relativistic case, however, requires a separate investigation of the dependence of the distribution of radiation on n. Integration of the vector potential by aid of Poynting's vector (giving the energy distribution of the n-th harmonic) and summation yields the distribution of the radiation in space which is practically concentrated in a plane. Integration of the energy formula gives the spectral distribution in ordinals of the harmonics. The latter formula is inconvenient as the harmonic ordinal numbers appear as argument and as ordinals of Bessel functions as well. The methods of approximation of Brillouin, Wentzel and Kramers applied to a second order diff. equation yield a good approximation for large values of the argument. A method given previously by one of the authors enables the approximation to be extended over the whole range of values of the argument, i.e. to exclude discontinuities. Two extreme cases are then discussed and an expression for the rate of energy decrease at extremely high frequencies is derived. B. P. K.

Moscow State Univ. im. M. V. Lomonosov, Agr. Acad. im. K. A. Timiryazev.

SOKOLOV, A.

USSR/Nuclear Physics - Cosmic Radiation Jul 48
Nuclear Physics - Particles

"Theory of Para- and Ortho- State of Elementary Particles," D. Ivanenko, A. Sokolov, Phys Inst, Moscow State U imeni M. V. Lomonosov, 3 pp

"Dok Ak Nauk SSSR" Vol LXI, No 1

According to a recent hypothesis, when a free electron and a positron collide, a metastable system (a positroni) consisting of two particles revolving about a common center of gravity occurs concurrently with annihilation. In a positroni atom, one must distinguish between systems with parallel (orthopositroni) and antiparallel (para-positroni) spins. Inasmuch as the life span of a positroni must dpend on the total spin, the question of investigation the para- and ortho-systems of a free electron and a positron naturally arises, especially as the difficult problem of annihilation of the para- and ortho-positronis may be connected with the annihilation of free particles, since the energy of combination of a positroni is many times less than the individual energy of a positron or electron. Authors discuss questions with aid of Dirac's matrices and Casimir's formulas. Submitted 15 Apr 1948

PA 8/49T101

SOKOLOV, A. A.; IVANENKO, D.

Classical Theory of Fields (Moscow-Leningrad, State Technical Press, 1949. Reviewed by M. F. Shirokov, Sov. Kniga, No. 8, 1950.

Report U-3081, 16 Jan 53

27059

Organizatsiya laboratornoye praktikuma po bystro razvivayushcheysya
distsipline (rikladnaya elektronika. S primech. Red., s.13). Vestnik
VYSS... Shkoly, 1949, No. 7, S. 26-31

T...SEVSKIY, B. Ye. i NIKOLAVSKIY, V.A.
Vibrotaliokop... platforma s programnym fotoelektricheskim upravleniyem.
-Sm 27059

5. Voronoye delo
A. Obshchiye voprosy

SO: LETOPIS' ...O. 34

SOKOLOV, A.

25/49T80

USSR/Nuclear Physics -- Mesotrons Jan 49
Nuclear Physics -- Cosmic Rays

"The Mass of Neutral Mesons," A. Sokolov, B. Kerimov, Sci Res Inst Phys, Moscow State U imeni M. V. Lomonosov, 4 pp

"Dok Ak Nauk SSSR" Vol LXIV, No 2

Establishes that the mass of neutral mesons, being brought into equilibrium with a system of nucleons, cannot exceed the value 130 m (m = the mass of one electron). Submitted 6 Nov 48.

25/49T80

SOKOLOV, A.

PA 1/50T80

USSR/Nuclear Physics - Luminescent Electron — Aug 49
Electrons-Acceleration

"The Quantum Theory of the Luminescent Electron,' A. Sokolov, Sci Res Inst of Phys, Moscow State U imeni M. V. Lomonosov, 4 pp

"Dok Ak Nauk SSSR" Vol LXVII, No 6

An electron rotating around a periphery, e.g., in cyclotron accelerating devices, becomes a source of electromagnetic radiation. The radiation intensity of higher harmonics is insignificant for nonrelativistic electron speeds.

[redacted] 1/50T80

USSR/Nuclear Physics - Luminescent Electron (Contd 1) — Aug 49

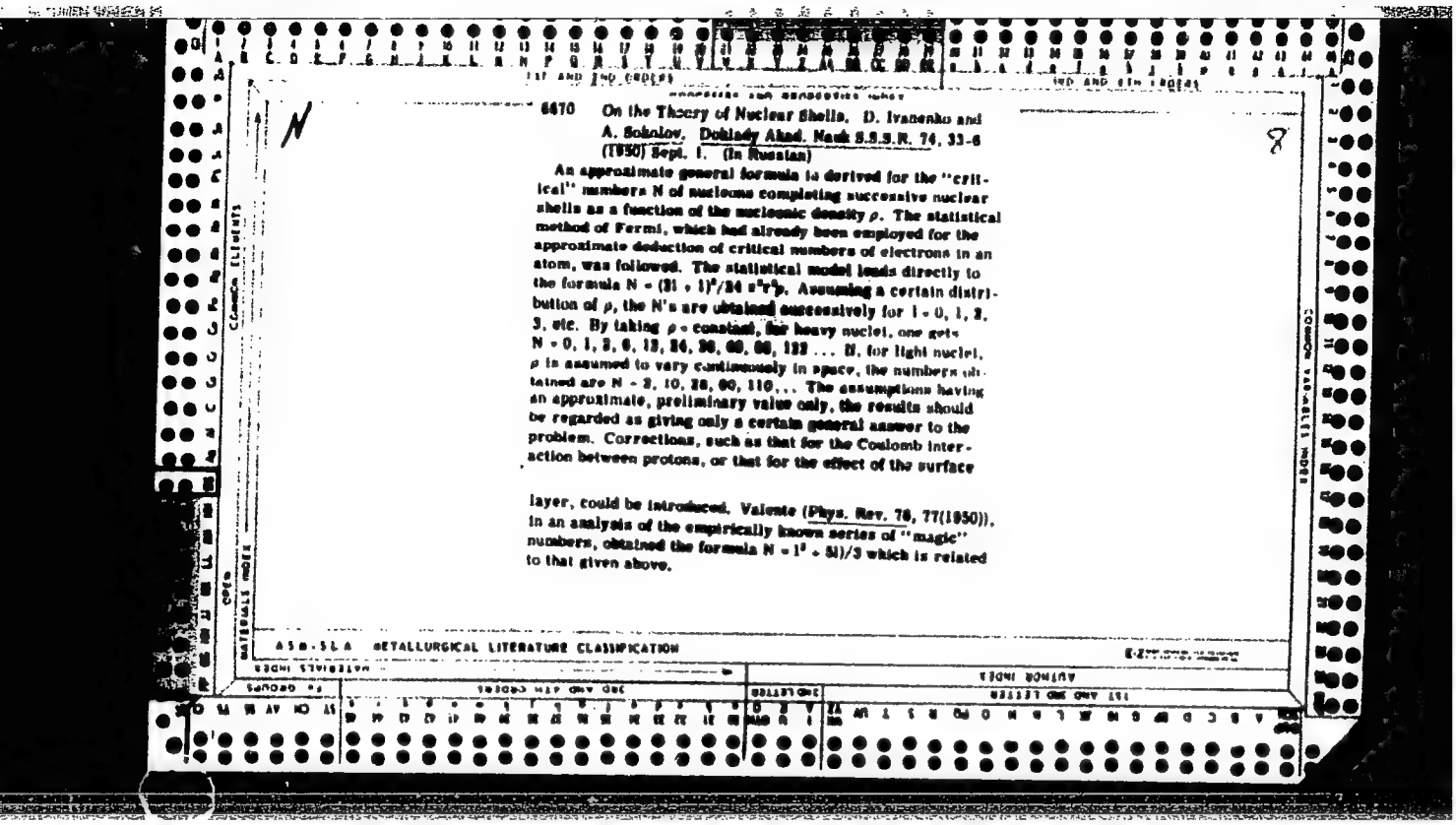
For electron speeds approximating the speed of light, the maximum radiation intensity lies in the region of the harmonics: n_o approximately equals $(E/mc^2)^3$, where E is the energy of the rotating electron, and m is its mass. For an electron of sufficiently high energy, the frequency $n_o w$ ($n_o$omega) may fall in the visible part of the spectrum, this being called the phenomenom of the luminescent electron. Attempts to find the influence of quantum corrections upon the curve of spectral radiation and the limits within which the classical theory

[redacted] 1/50T80

USSR/Nuclear Physics - Luminescent Electron (Contd 2) — Aug 49

may be applied to the luminescent electron. Submitted by Acad S. I. Vavilov 25 Jun 49.

[redacted] 1/50T80



6670 On the Theory of Nuclear Shells. D. Ivanenko and A. Sokolov. Doklady Akad. Nauk S.S.S.R. 74, 33-6 (1950) Sept. 1. (In Russian)

An approximate general formula is derived for the "critical" numbers N of nucleons completing successive nuclear shells as a function of the nucleonic density ρ. The statistical method of Fermi, which had already been employed for the approximate deduction of critical numbers of electrons in an atom, was followed. The statistical model leads directly to the formula $N = (2l + 1)^3/24\pi^2\rho$. Assuming a certain distribution of ρ, the N's are obtained successively for $l = 0, 1, 2, 3$, etc. By taking ρ = constant, for heavy nuclei, one gets $N = 0, 1, 2, 8, 18, 36, 56, 80, 108, 144 \ldots$ If, for light nuclei, ρ is assumed to vary continuously in space, the numbers obtained are $N = 2, 10, 28, 60, 110, \ldots$ The assumptions having an approximate, preliminary value only, the results should be regarded as giving only a certain general answer to the problem. Corrections, such as that for the Coulomb interaction between protons, or that for the effect of the surface layer, could be introduced. Valente (Phys. Rev. 76, 77(1950)), in an analysis of the empirically known series of "magic" numbers, obtained the formula $N = (l^2 + 3l)/3$ which is related to that given above.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

SOKOLOV, A. A.; IVANENKO, D. D.

Classical Field Theory (Klasicheskaya Teoriya Polya). This is the second edition, published in 1951 and has 479 pages.

BOKOLOV, A. A., MARKOV, M. A., DRABNIKA, S. I., SUVOROV, S. G. (Editor), AKHLAMOV, S. N. (Tech. Editor), and FEYNBERG, Ye. A.

D. I. Blokhintsev, "Fundamentals of Quantum Mechanics", Osnovy Kvantovoy Mekhaniki, State Press for Technical-Theoretical Literature.

Table of Contents W-17671, 5 Apr 1951

SOKOLOV,

"Optical Properties of Metal Alloys in the Infra-Red Region of the Spectrum." SOKOLOV and others. "ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI" 4/1952.

Mathematical Reviews
Vol. 14 No. 10
Nov. 1953
Mathematical Physics

Sokolov, A., i Ivanenko, D. Kvantovaya teoriya polya. (Izbrannye voprosy.) [The quantum theory of fields. (Selected questions.)] Gosudarstv. Izdat. Tehn.-Teor. Lit. Moscow-Leningrad, 1952. 780 pp. 14.30 rubles.

The book consists of two separate parts. Part I, "Quantum electrodynamics" by A. Sokolov (pp. 9–480), is based on a lecture course for students specializing in theoretical physics. Particular consideration is given to papers published in Russia. Knowledge of the authors' "Classical theory of fields" [2nd ed., Gostehizdat, Moscow-Leningrad, 1951; see these Rev. 13, 95 for a review of the 1st ed.] is presupposed. The quantum theory of the electron and of the electromagnetic field is presented in the way customary before the use of the interaction representation. The quantum theory of radiation is developed in considerable detail and applied to a number of problems. (This section of the book is about equivalent to Heitler's "Quantum theory of radiation" [2nd ed., Oxford, 1944].) The theory of positronium and of cosmic radiation processes is outlined. A chapter on the theory of the vacuum covers topics hardly accessible elsewhere in textbooks, like self-energies, regularization methods, radiative corrections, Lamb-shift, infrared catastrophe, etc. There is also an interesting paragraph on the domain of applicability of quantum theory where the Soviet point of view of the interpretation of quantum mechanics is presented. We read, for instance, on p. 184:

over —

SOKOLOV, A. A.

USSR/Physics - Gravitational Field Sep 52

"Remarks on the Quantum Theory of A Gravitational Field," A. A. Sokolov, Moscow State Univ, Chair of Theoretical Physics

Vest Mos Univ, Ser Fizikomat i Yest Nauk, No 6, pp 9-20

Attempts quantization of gravitational field by considering a weak gravitational field, the eq of which allows one to neglect terms of higher order. Demonstrates that in linear approximation eqs of gravity may be classified into the general scheme

275T107

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of elementary particles, consisting of neutral particles with zero rest-mass and spin of two. Discusses existence of two-dimensional gravitational waves. Rec 30 Apr 52.

SOKOLOV, A.A., professor.

Train highly qualified cadres of physicists. Vest.Mosk.un.8 no.12:9-15 D '53. (MLRA 7:2)

1. Dekan Fizicheskogo fakul'teta. (Physics--Study and teaching)

SOKOLOV, A.A.

USSR

537.533.9

8349. On the quantum theory of a luminescent electron. II. A. A. SOKOLOV, N. P. KLEPIKOV AND I. M. TERNOV. *Zh. eksper. teor. Fiz.*, **24**, *No.* 3, 249–52 (1953) *In Russian.*

In continuation of Pt I [Abstr. 528 (1954)], the authors find the total intensity of radiation, assuming $n/l \ll 1$. The final equation is

$$I = \frac{2}{3}e^2\left(\frac{E}{mc^2}\right)^4\left[1-55\frac{\sqrt{3}}{16}\left(\frac{\lambda}{mcR}\right)\left(\frac{E}{mc^2}\right)^3+\ldots\right],$$

where R = radius of classical orbit, and E = electron energy. [See also Abstr. 8224 (1953)]. F. LACIMAN

SOKOLOV, A.A.

USSR 1

539.153 : 537.12/.13

8339. Formation of metastable compounds from elementary particles (positronium). A. A. SOKOLOV AND V. N. TSYTOVICH. *Zh. éksper. teor. Fiz.*, 24, No. 3, 233–41 (1953) *In Russian.*

See Abstr. 1005–7, 4971 (1949); 1504, 3320 (1950); 3390 (1951); 267, 2917 (1952). Discusses the interaction between quantized states, and the wave-functions with fourth-order matrices are converted into those with second-order matrices. Approximate formulae are obtained for the interaction between 2 charged particles and, finally, the wave-functions and energy of positronium are derived, thus enabling the possibility of formation of metastable positronium states to be assessed. The positronium transitions in magnetic fields are discussed.

F. LACHMAN

Sokolov, A. A.

5000

537.533.9

5153. ON THE QUANTUM THEORY OF A LUMINESCENT ELECTRON. III-IV. A.A.Sokolov and I.M.Ternov. Zh. éksper. teor. Fiz., Vol. 25, No. 6(12), 698-712 (1953); Vol. 28, No. 4, 431-6 (1955). In Russian.

For Pt II, see Abstr. 8349 (1954). An expression is developed for the quantum corrections to the trajectory of a relativistic electron in a magnetic field with axial symmetry.

F.Lachman

SOKOLOV, A. A.

USSR/Nuclear Physics - Deuterium Lamb-Shift

Sep 53

"The Lamb-Shift for Hydrogen and Deuterium" [translation into Russian with comments by Yu. M. Shirokov]

Usp Fiz Nauk, Vol 51, No 1, pp 115-129

Translation of E. Salpeter's article in Phys Rev 89, 92 (1953). Translator appends 6 supplementary Russian-language references on the Lamb-shift and other radiative corrections: 1. V. F. Vayskopf, Usp Fiz Nauk, 41, 165 (1950). 2. Ya. A. Smorodinskiy, Usp Fiz Nauk, 39, 325 (1949). 3. Scientific abstract symposium 'Problemy Sovremennoy Fiziki', No 6, 1948; No 1, 1950; No 11, 1951. 4. Sdvig Urovney Atomnykh Elektronov (Shift of Levels of Atomic Electrons), a symposium, Foreign Literature Press, Moscow, 1950. 5. A. A. Sokolov and D. D. Ivanenko, Kvantovaya Teoriya Polya (Quantum Theory of the Field), Gostekhizdat (State Tech Press), Moscow, 1952. 6. W. Lamb, "Fine Structure of the Hydrogen Atom" [translated from English into Russian], Usp Fiz Nauk 45, 553 (1951).

264T94

SOKOLOV, A.A.; KLEPIKOV, N.P.; TERNOV, I.M.

On the question of radiation by fast electrons in a magnetic field. Dokl. Akad. Nauk S.S.S.R. 89, No.4, 665-8 '53. (MLRA 6:3)
(PA 56 no.672:8224 '53)

In further developing works on quantum theory of luminescing electron (A.A.Sokolov, DAN SSSR, 67, 1949; A.A.Sokolov et al., "Classical Field Theory (Klassicheskaya teoriya pola), 1951; N.P.Klepikov, Dissertation; A.A.Sokolov et al., ZhETF, 23, 1952) authors succeeded in computing quantum corrections to full intensity of emission. Presented by Acad. V.V.Shuleykin 16 Feb 53. 256T107

SOKOLOV, A. A.

USSR/Nuclear Physics - Electrodynamics 21 Sep 53

"Problem of Motion of Fast Electrons in a Magnetic Field," A.A. Sokolov and I.M. Ternov, Moscow State U

DAN SSSR, Vol 92, No 3, pp 537-540

Continue the study of the motion of fast electrons discussed previously (DAN 89, (1953)). Add quantum corrections to the trajectory of motion. Presented by Acad V.V. Shuleykin 22 Jul 53.

268T85

SOKOLOV, N.N.

USSR

1107. On a statistical theory of the atomic nucleus. II. A. A. SOKOLOV AND B. K. KERIMOV. *Zh. Eksper. Teor. Fiz.*, 26, No. 4, 430-8 (1954) In Russian.

See Abstr. 8511 (1954). A statistical 1st-order perturbation treatment of the energy of infinitely extended nuclear matter, using a meson-type two-body potential containing central and tensor forces appropriate to 2 meson fields (vector and ps. scalar) of different masses, and coupling strengths chosen to eliminate the r^{-3} singularity in the tensor force. The expression for the total energy per unit volume is integrated out explicitly and the condition for a minimum with respect to change of density is written down. If the masses of the mesons are taken as $265m_e$ the coupling constants deduced from this condition are not much less than 1, and a perturbation treatment is doubtful. If one of the mesons (vector) is $130m_e$, small coupling strengths are sufficient. W. J. SWIATECKI

SOKOLOV, A. A.

USSR/Physics

Card : 1/1 Pub. 22 - 18/48

Authors : Sokolov, A. A. and Chernov, I. M.

Title : The quantum theory on motion of a relativistic electron in an axially-symmetrical magnetic field

Periodical : Dok. AN SSSR 97/5, 823 - 826, August 11, 1954

Abstract : Quantum theory of a moving electron with velocities affecting its mass in a variable magnetic field is described. Seven references (1941-1954).

Institution : Moscow State University of im. M. V. Lomonosov

Presented by : Academician V. V. Shuleykin, May 18, 1954

Sokolov, A A

USSR

5200

QUANTUM THEORY OF THE RADIATING ELECTRON. IV.
A. A. Sokolov and I. M. Ternov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Phys. 28, 431-6(1955) Apr. (In Russian)
An expression is derived for the quantum correction to the trajectory of a relativistic electron in an axial-symmetric magnetic field. (tr-auth)

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62

Sokolov A. A.

USSR/ Physics - Quantum mechanics

Card 1/1 Pub. 22 - 16/49

Authors : Sokolov, A. A.; Matveev, A. N.; and Ternov, I. M.

Title : On polarization and spin effects in the theory of a glowing electron

Periodical : Dok. AN SSSR 102/1, 65-68, May 1, 1955

Abstract : A mathematical analysis is outlined for determining the intensity of glow of a relativistic electron during its transition from one quantum state (n) into another (n' = n-v) in a constan homogeneous magnetic field. Particles with 1/2 spin and without spin are considered. Polarizing characteristics of radiated light are analyzed with the help of Diraki's equation. Eleven references: 3 USA, and 8 USSR (1941-1954).

Institution: M. V. Lomonosov's State University, Moscow

Presented by: Academician N. N. Bogolyubov, January 21, 1955

Sokolov, A.A.

21

Sokolov, A. A.; and Kerimov, B. K. On the theory of scattering of Dirac particles, taking damping into account. Dokl. Akad. Nauk SSSR (N.S.) 105 (1955), 961–964. (Russian)

Calculations are carried out for the scattering of a Dirac particle by a central force, based on the use of wave functions involving damping [W. Heitler, Proc. Cambridge. Philos. Soc. 37 (1941), 291–300; MR 4, 95; A. H. Wilson, ibid. 301–316; MR 4, 95; A. A. Sokolov, Acad. Sci. USSR. J. Phys. 5 (1941), 231–237; MR 4, 96]. The equations obtained are applied to the case in which the scattering potential is proportional to the Dirac delta-function.

N. Rosen (Haifa).

Math?

Phys

2

Tikhonov, A.N.

TIKHONOV, A.N., prof.; SOKOLOV, A.A., prof., otv.red.

[Program in higher mathematics; for the Physics Faculty] Programma po vysshei matematike (dlia fizicheskogo fakul'teta). 1956. 7 p. (MIRA 11:3)

1. Moscow. Universitet. 2. Chlen-korrespondent AN SSSR (for Tikhonov)
(Mathematics--Study and teaching)

Category : USSR/Theoretical Physics - Quantum Electrodynamics B-5

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 5674

Author : Sokolov, [redacted]
Title : Theory of the Radiating Electron

Orig Pub : Tr. 3-go Vses. matem. s"ezda, 2. M., AN SSSR, 1956, 95-96

Abstract : After developing the theory of the emission from a radiating electron, the author, in particular, notes the results obtained by him jointly with A.N. Matveyev, that the attenuation time of the betatron oscillations is $t = [3r^2/2r_0c(1-q)]\, mc^2/E$ where q is the index representing the drop in the magnetic field near the equilibrium orbit with radius r. This time is large compared with the sensible values of the duration of the acceleration cycle, and consequently, the radiational attenuation can be neglected up to very large energies.

Card : 1/1

Sokolov, A.A.

RUMANIA/Theoretical Physics B-5

Abs Jour : Referat Zhur - Fizika, No 5, 1957, No 10869

Author : Sokolov, A.A.

Inst : Moscow State University

Title : Concerning the Problem of the Possibility of Excitation of Macroscopic Oscillations by Quantum Fluctuations ("macroatom").

Orig Pub : Bul. Inst. politehn. Iasi, 1956, 2, No 1-2, 39-42

Abstract : The author considers the effect of radiation on the motion of an electron in an axially symmetrical magnetic field. It is shown that the presence of radiation leads to a change in the radial quantum number, i.e., to an increase in the square of the amplitude of the radial oscillations. The author also gives a semi-classical interpretation of this phenomenon. The author indicates that the motion of

Card 1/2

RUMANIA/Theoretical Physics B-5

Abs Jour : Referat Zhur - Fizika, No 5, 1957, No 10869

the electron in an axially symmetrical magnetic field in the presence of radial oscillations with macroscopic amplitudes forms some kind of a "macroatom". It is indicated that a unique principle of uncertainty exists for the "macroatom". It is emphasized that the quantum corrections are first connected together on the radial oscillations [for energies $E \sim E_{1/5}$, $(\mu = 1/5)$, $E_\mu = mc^2 (E/mc^2)^\mu$] and then on the axial oscillations (at $E \sim E_{1/3}$), and finally, in the region of very high energies (at $E \sim E_{1/2}$) -- on the radiation intensity.

Card 2/2

SOKOLOV, A.A.

4

Distr: 4E3d /4E4c

1-F\W

2

Sokolov, A. A.; and Tsytovich, V. N. The theory of the electron field mass in the presence of an external medium. Soviet Physics. JETP 3 (1956), 94–97.

To calculate the difference between the value of the electron mass in vacuo and in a medium characterized by its dielectric constant and its magnetic permeability the field equations of quantum electrodynamics are solved in second approximation for the emission and absorption of a photon in the medium. A convergent expression is obtained for this difference and for the corresponding level shift in a hydrogen atom. This shift is much smaller than the Lamb shift, but under normal pressure and temperature larger than the shift due to the interaction between the electron and the radiation field. *E. Gora.*

Sakolov, A.A.

USSR/Theoretical Physics - Quantum Electrodynamics. B-5

Abs Jour : Referat Zhur - Fizika No 1, 1958, 191

Author : Sakolov, A.A.
Inst :
Title : Relativistic Motion of Electrons in a Magnetic Field with Account of Quantum Effects.

Orig Pub : Vestn. Mosk -un-ta,ser. matem., mekhan., astron., fiz., khimii, 1956, No 2, 27-46

Abstract : An article of review character. The introduction discusses the fundamental premises of quantum theory of the radiating electron. The following chapters consider in detail the swing of the betatron oscillations of electrons in cyclic accelerators, due to the quantum character of radiation. Problems connected with radiation damping of betatron oscillations are briefly discussed in the appendix.

Card 1/1 Chr. Statistics, Physics & Mechanics Moscow State Univ

SOKOLOV, A. A.

537.533.9

28154. ON THE RADIATION EMITTED BY ULTRA-HIGH-VELOCITY ELECTRONS MOVING IN A CONSTANT MAGNETIC FIELD. A.A.Sokolov and A.N.Matveev. Zh. éksper. teor. Fiz., Vol. 30, No. 1, 126-35 (1956). In Russian.

The present paper is a continuation of previous investigations of the quantum theory of the "luminous" electron (see preceding abstract). A formula for the differential radiation spectrum has been obtained which is uniformly correct in any spectral range and for energies of the radiating electron $E \ll E_{1/2} = mc^2(2Rmc/3h)^{1/3}$ as well as for energies $E \cong E_{1/2}$ and $E \gg E_{1/2}$. A closed formula for the total radiation energy which is uniformly valid for arbitrary energies of the radiating electron and also a formula for the "critical" radiation frequency of the "luminous" electron have been obtained. A.

4820. THEORY OF ELECTRON FIELD MASS IN THE PRESENCE OF A MEDIUM. A.A.Sokolov and V.N.Tsytovich. Zh. éksper. teor. Fiz, Vol. 30, No. 1, 130-40 (1956). In Russian. 530.145

Field contributions to the electron mass due to an external medium are considered. The electron-positron vacuum is taken into account in the calculations.

A.

Card : 1/1

tically independent fluctuation forces in the classical [illegible] of th[illegible] identity of both methods as a con-

PA - 1226

Zurn.eksp. i teor.fis, 30, 802-803 (1956) CARD 2 / 2

nection between the quantum-like method and the theory of oscillations where the so-called MARKOV chains occur, i.e. the statistical independence of successive processes.

The authors endeavor to explain the quantum-like micro motion of the electron by the effect produced by fluctuations of virtual photons. Under the influence of the field of virtual photons the classical quantities x and p_x (momentum of the particle) become non-commutating operators, and in first approximation the same exchange relations as in the wave theory are obtained. If, for x and p_x the corresponding operator expressions are put, the energy levels for the harmonic oscillator are obtained. If a certain formula for the momentum is used, zero energy automatically contains the necessary terms of subtraction, and the finite quantity $E_o = (\hbar\omega_o/2) + (\hbar\omega_o^2 e^2/3\pi c^3 m)(\ln(3c^3 m/2e^2\omega_o)-1)$ remains.

The first term is the known expression for zero energy without vacuum terms, and the second term is due to the influence of the vacuum. Similarity to the corresponding strictly quantum-electrodynamically derived formula is shown. Thus, the classical motion of an electron itself becomes quantumlike by interaction with the secondarily quantized field of the (really emitted or only virtual) photons.

INSTITUTION: Moscow State University.

PA - 1660

CARD 1 / 2

SUBJECT USSR / PHYSICS

AUTHOR SOKOLOV, A.A., TERNOV, I.M., STRACHOVSKIJ, G.M.

TITLE The Investigation of the Stability of the Motion of Electrons in Cyclical Acceleration devices in consideration of Quantum Effects.

PERIODICAL Zurn.eksp.i teor.fis, 31, fasc.3, 439 - 448(1956)
Issued: 12 / 1956

In connection with this quantum-theoretical investigation of the motion of the electron in a magnetic field the possible occurrence of radial and also of axial oscillations is taken into account. Such problems are best solved in cylindrical coordinates r, z, φ.

Above all the motion in cylindrical betatron-like devices is explained, in which the magnetic field H is modified within the domain of the stationary orbit ($r=R_o$ =const, z=0) according to the law $H = \text{const.}r^{-q}$. The mean value $\bar{H}$ is assumed to satisfy the WIDEROE condition $\bar{H}(R_o) = (2/R_o^2)\int_0^{R_o} rH(r)\,dr = 2H(R_o)$ and further be it assumed that $\operatorname{div} H = 0$ and $\operatorname{curl} H = 0$.

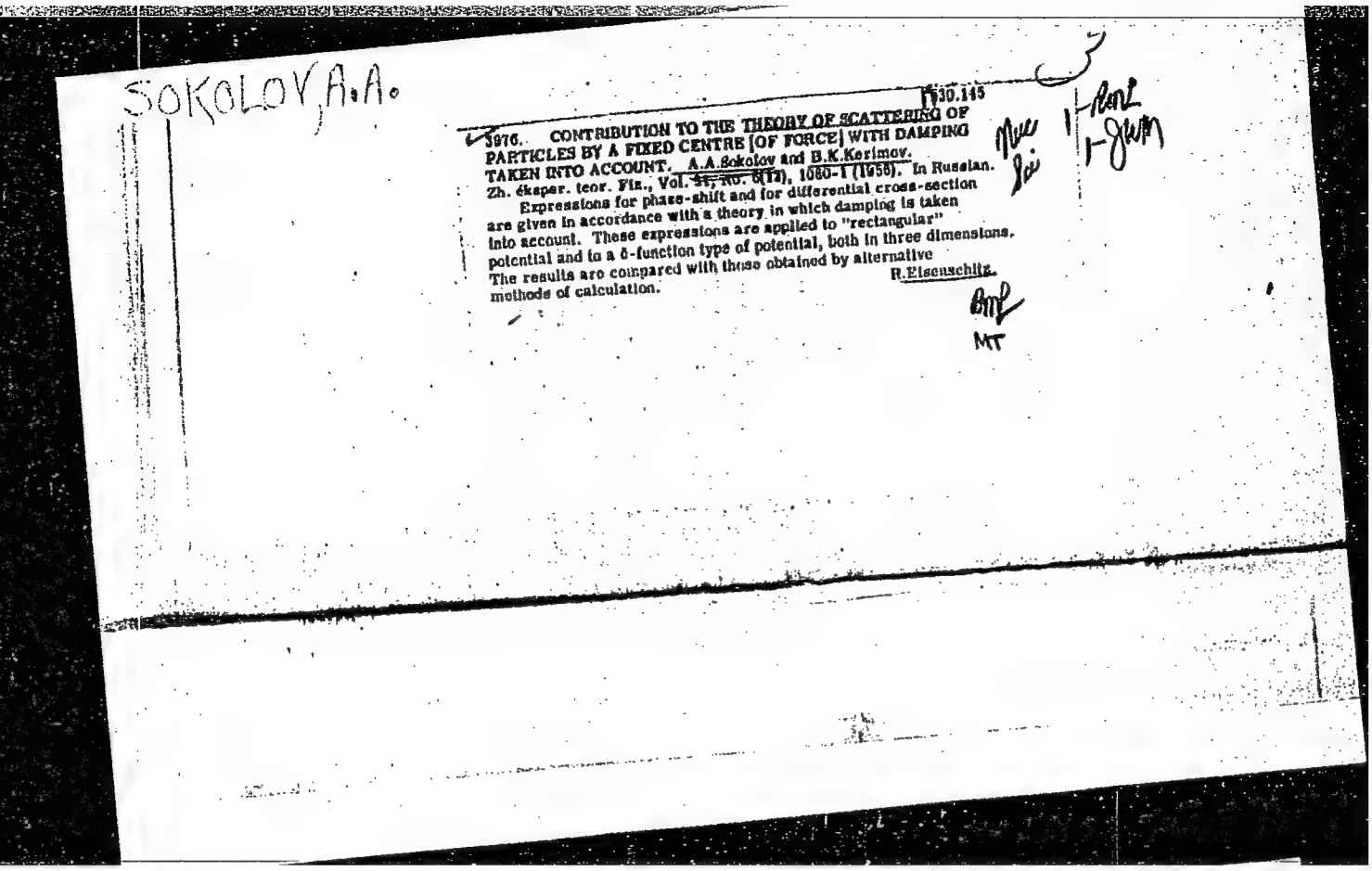
At first the adiabetic invariants and the equilibrium orbit are investigated. The electron orbit taking quantum effects into account can be determined by means of BOHR's theory, and results in first approximation agree with those of the rigorous quantum theory. This method is well suited for practical purposes. Here three adiabetic invariants are introduced which are in connection with the azimuthal, radial, and axial quantum members.

Next, the oscillations of the electron round the present equilibrium orbit are investigated on the basis of the classical theory. On this occasion the adiabetic invariants are supposed to be different from zero. The quantum-like corrections to

CARD 1 / 2 PA - 1663

SUBJECT USSR / PHYSICS
AUTHOR SOKOLOV,A.A., TERNOV,I.M.
TITLE On the Polarization Effects in the Radiation of the Radiating Electron.
PERIODICAL Žurn.eksp.i teor.fis,31, fasc.3, 473-478 (1956)
Issued: 12 / 1956

These polarization effects are investigated by quantumlike methods, but in classical approximation. At first the amplitudes of the linear and circular polarization of the photon field are computed. The commutation relations for the amplitudes of the vector field are given. On the occasion of the investigation of the polarization effect it is necessary to subdivide the amplitude $\vec{a}$ of the vector potential into components, each of which characterizes a certain polarization state. In the case of linear polarization $\vec{a}$ must be subdivided into two components which are vertical to each other. Also the procedure to be applied in the case of circular polarization is mentioned. The expression for the radiation intensity is $W_i = \sum_\nu \int_0^\pi d\Theta \sin\Theta\, W_i(\nu,\Theta)$, and on this occasion the relation $W_i(\nu,\Theta) = ce^2 S_i$ applies to the spectral- and angular distribution of radiation intensity. The index i characterizes the polarization state ($i = 2,3,1,-1$) and Θ denotes the angle between the wave vector and the z-axis. Also a formula for the connection between S and the amplitudes of the photon field is given. The expressions for S are specialized for linear and



SOKOLOV, A.A.

3976. CONTRIBUTION TO THE THEORY OF SCATTERING OF PARTICLES BY A FIXED CENTRE [OF FORCE] WITH DAMPING TAKEN INTO ACCOUNT. A.A.Sokolov and B.K.Kerimov. Zh. éksper. teor. Fiz., Vol. 31, No. 6(12), 1080-1 (1956). In Russian.

Expressions for phase-shift and for differential cross-section are given in accordance with a theory in which damping is taken into account. These expressions are applied to "rectangular" potential and to a δ-function type of potential, both in three dimensions. The results are compared with those obtained by alternative methods of calculation.

R.Eisenschitz.

SOKOLOV, A.A.

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1-48[illegible]

1-F\W

Sokolov, A. A.; and Kerimov, B. K. On the scattering by spin-less particles taking into account damping. Dokl. Akad. Nauk SSSR (N.S.) 108 (1956), 611–614. (Russian)

The scattering of a spinless particle by a static short-range potential is described by means of the Klein-Gordon equation. An approximate solution of the equation is given which reduces at $t=0$ to a state of definite momentum. By including the effects of damping, it is arranged that the approximate solution yields strict conservation of probability. Formulae are given for the differential and total scattering cross sections which follow from the wave function. Approximate expressions for the phase shifts and total cross section for small momenta and large angular momentum are worked out in the special case of the Yukawa potential.

A. S. Wightman.

MT

SUBJECT USSR / PHYSICS

AUTHOR SOKOLOV,A.A., IVANENKO,D.D., TERNOV,I.M.

TITLE On the Excitation of Macroscopic Oscillations by Quantumlike Fluctuations.

PERIODICAL Dokl.Akad.Nauk 111, fasc.2, 334-337 (1956)

Issued: 1 / 1957

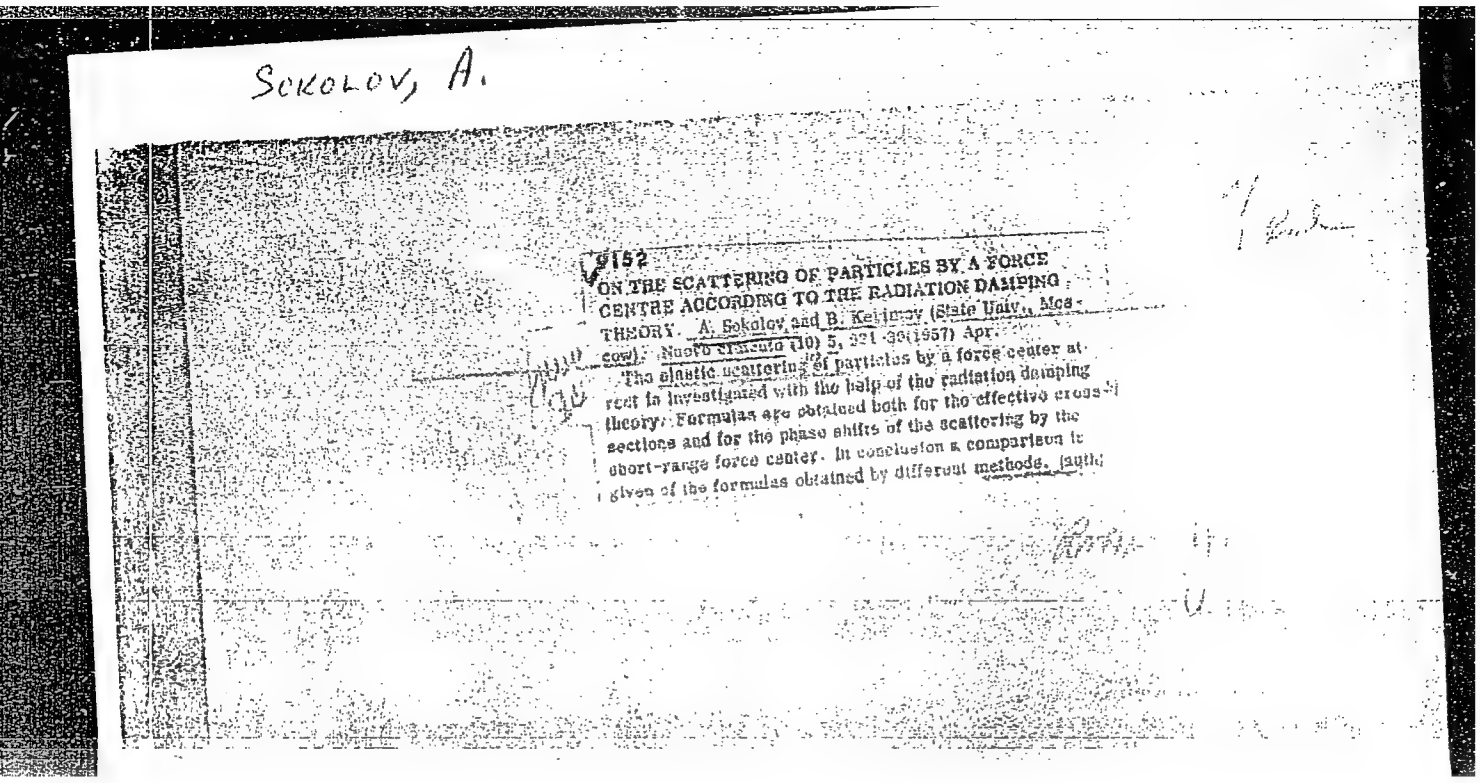
The energy of a relativistic electron moving in a homogeneous magnetic field H can be represented as the sum of the energy of the rotation movement E_1 of the electron and the energy of the oscillation motion E_s along the radius: $E_l \sim \sqrt{2eHc\hbar\, l + m^2c^4}$, $E_s \sim \hbar\omega\, d = E\omega^2 a^2/2c^2$. Here $n = l + s$ denotes the principal quantum number, l - the azimuthal- and s - the radial quantum number, a - the amplitude of the radial oscillations. Next, formulae for the modification of the rotation- and oscillation energy on the occasion of the transition of an electron from the state n into the state $n' = n - \nu$ is given. The sum of these two modifications results in the entire energy loss by radiation while taking account of quantumlike corrections with an accuracy of up to $\hbar$. The quantumlike corrections to the rotation movement can take effect only in the case of high energies. With $\hbar \to 0$ there is no modification of the energy of the radial oscillations at all, i.e. in the classical case the value of s remains constant even if radiation is taken into account. Only in the quantum-like case ($\hbar = 0$) does one peculiar energy jump occur if rotation energy is used not only for radiation but also for the excitation of radial oscillations

[illegible]

The theory of luminous electrons.

[illegible] (Academia Republicii Populare Romine. Institutul de Fizica. Studii Si Cercetari de Fizica. Vol. 7, [illegible]. 3, July/Sept. 19[illegible]. Bucuresti, Rumania)

Monthly Index of East European Accessions (EEAI) LC. Vol. 7, no. 2, February 1958



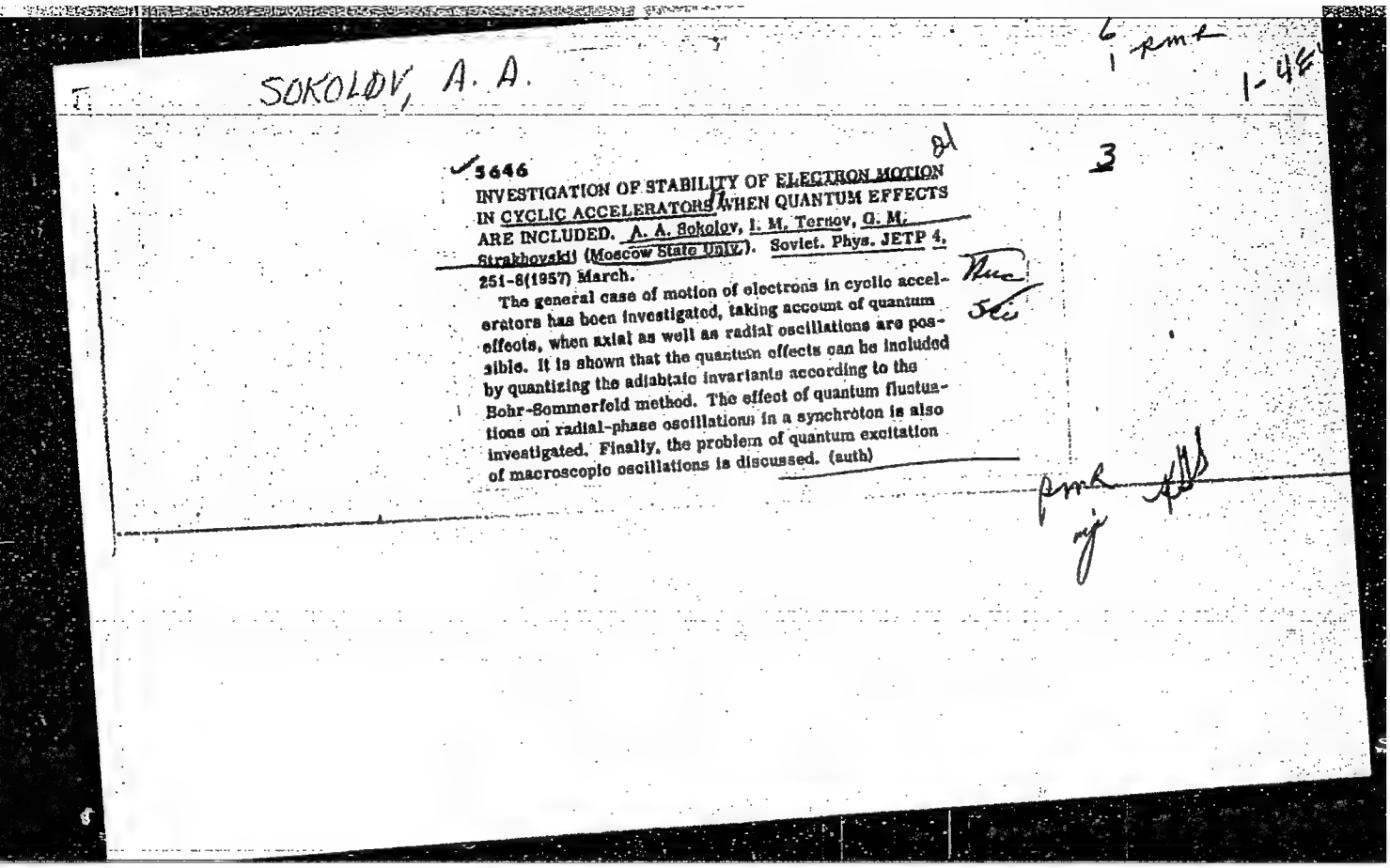
Sokolov, A.

9152
ON THE SCATTERING OF PARTICLES BY A FORCE CENTRE ACCORDING TO THE RADIATION DAMPING THEORY. A. Sokolov and B. Kelimov (State Univ., Moscow). Nuovo cimento (10) 5, 321-38(1957) Apr.

The elastic scattering of particles by a force center at rest is investigated with the help of the radiation damping theory. Formulas are obtained both for the effective cross-sections and for the phase shifts of the scattering by the short-range force center. In conclusion a comparison is given of the formulas obtained by different methods. [auth]

SOKOLOV, A.A.

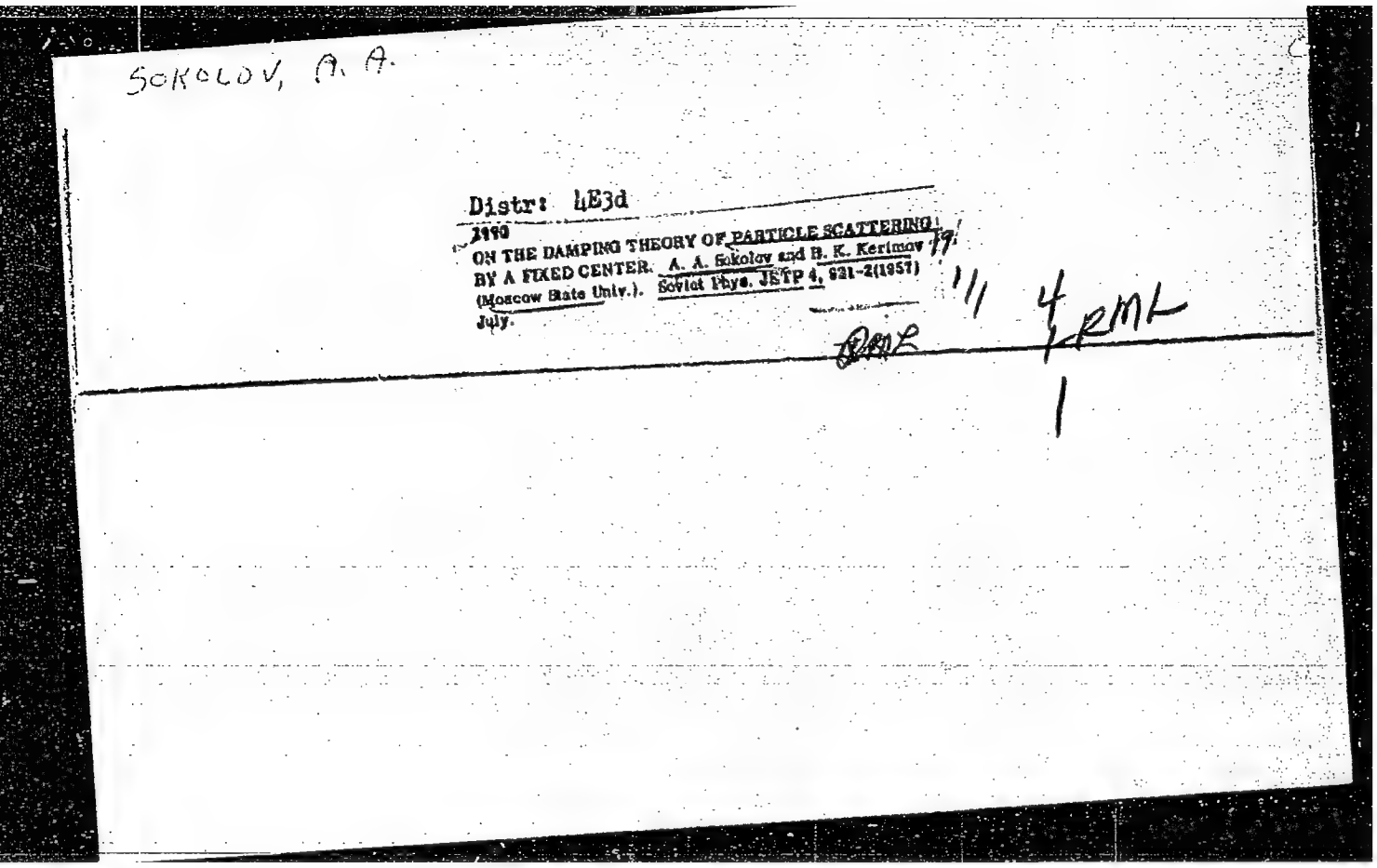
"On the Theory of the ,,Luminous' Electrons," paper presented at CERN Symposium, 1956, appearing in Nuclear Instruments, No. 1. pp. 21-30, 1957



SOKOLOV, A. A.

5646
INVESTIGATION OF STABILITY OF ELECTRON MOTION IN CYCLIC ACCELERATORS WHEN QUANTUM EFFECTS ARE INCLUDED. A. A. Sokolov, I. M. Ternov, G. M. Strakhovskii (Moscow State Univ.). Soviet. Phys. JETP 4, 251-8(1957) March.

The general case of motion of electrons in cyclic accelerators has been investigated, taking account of quantum effects, when axial as well as radial oscillations are possible. It is shown that the quantum effects can be included by quantizing the adiabatic invariants according to the Bohr-Sommerfeld method. The effect of quantum fluctuations on radial-phase oscillations in a synchroton is also investigated. Finally, the problem of quantum excitation of macroscopic oscillations is discussed. (auth)



SOKOLOV, A. A.

Distr: 4E3d

2190
ON THE DAMPING THEORY OF PARTICLE SCATTERING BY A FIXED CENTER. A. A. Sokolov and B. K. Kerimov (Moscow State Univ.). Soviet Phys. JETP 4, 821-2(1957) July.

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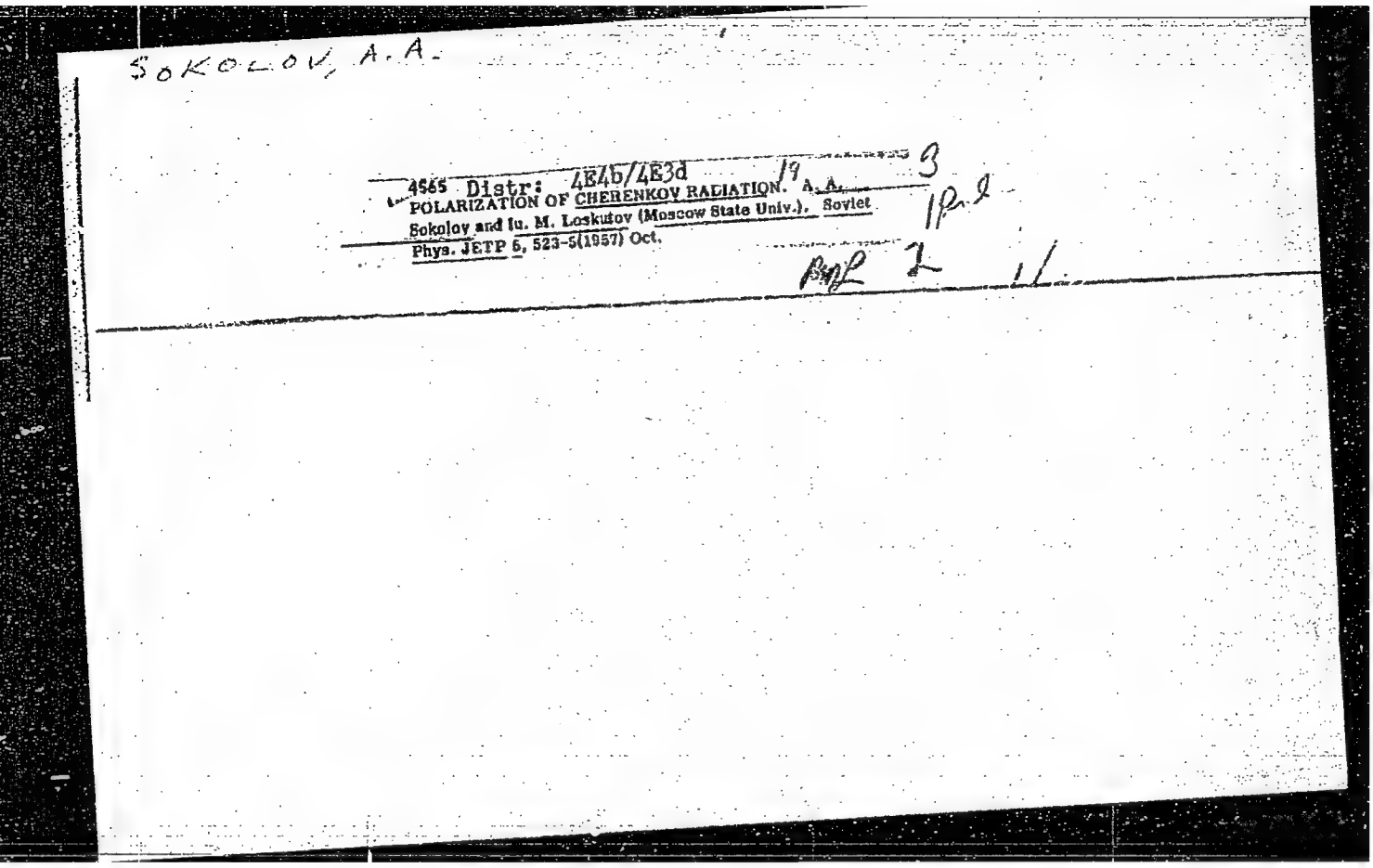

SOKOLOV, A.A.

4565 Distr: 4E4b/4E3d
POLARIZATION OF CHERENKOV RADIATION. A.A. Sokolov and Iu. M. Loskutov (Moscow State Univ.). Soviet Phys. JETP 6, 523-5(1957) Oct.

PA - 2007

AUTHOR: SOKOLOV,A.A., KERIMOV,B.K.

TITLE: On the Theory of the Scattering of Particles by a Steady Center in Consideration of Damping.

PERIODICAL: Zhurnal Eksperimental'noi i Teoret.Fiziki, 1957, Vol 31, Nr 6, pp 1080-1081 (U.S.S.R.)

Received: 1 / 1957 Reviewed: 3 / 1957

ABSTRACT: The theory of damping proves to be the stage that follows according to the perturbation theory and allows the calculation of the cross section σ not only within range of the long DE BROGLIE wave lengths ($\sigma < \lambda^2$), but also within the range of smaller wave lengths ($\sigma \gg \lambda^2$). The relation $C^+C + \sum_{k'} C'^+C' = 1$ set up in connection with the development of the theory of damping indicates that the total sum of the inciding and scattering particles stays constant at any moment. Some preparatory works on this matter are cited.

At first the exact formula for the cross section of the elastic scattering of particles with the momentum $\hbar k (k = 2\pi/\lambda)$ is given: $\sigma = (4\pi/k^2) \sum_{l=0}^{\infty} (2l+1) \sin^2 \eta_l$.

The perturbation theory allows the determination of the phase of η_l in the case of $\eta_l \ll 1$. However, the theory of damping supplies the following more exact approximation for phase shift: $\operatorname{tg} \eta_l = -(\pi K/c\hbar) \int_0^{\infty} rV(r) J^2_{l+1/2}(kr)\,dr$, and this expression at $\eta_l \ll$ goes over into the one given by the perturbation theory for this phase. Next, a rather voluminous expression for the differential cross section of elastic scattering is given. It was found by means of the damping

CARD 1 / 2

PA - 3000

AUTHOR SOKOLOV A.A., LOSKUTOV YU.M.

TITLE On the Polarization Properties of Cherenkov Radiation. (O polyarizatsionnykh svoystvakh izlucheniya Cherenkova.- Russian)

PERIODICAL Zhurnal Eksperim. i Teoret. Fiziki 1957, Vol 32, Nr 3, pp 630-632 (USSR).

Received: 6/1957 Reviewed: 7/1957

ABSTRACT For the investigation of these polarization properties in dependence on the spin of the charged particles the authors here make use of the methods developed in the paper by A.A. SOKOLOV and I.M. TERNOV (Zhurn.eksp. i teor. fiz Vol 31, p 473 (1956)).

When computing linear polarization it is necessary to split up the amplitude of the vector potential of the secondary quantized photon field into two components which are vertical to each other:

$$\vec{a} = \vec{a}_2 + \vec{a}_3 = \vec{\beta}_2 q_2 + \vec{\beta}_3 q_3, \vec{\beta}_2 = [\vec{\varkappa}^0 \vec{k}^0] / \sqrt{1 - (\vec{\varkappa}^0 \vec{k}^0)}, \vec{\beta}_3 = [\vec{\varkappa}^0 \vec{\beta}_2]$$

Here $\vec{\varkappa}^0 = \vec{\varkappa} / \varkappa$ denotes the unit vector characterizing the motion of the photon. When investigating the circular polarization the vector potential must be divided into two components i a

CARD 1/3

On the Polarization Properties of Cherenkov Radiation.

different manner:

$$\vec{a} = \vec{a}_1 + \vec{a}_{-1} = \vec{\beta}_1 q_1 + \vec{\beta}_{-1} q_{-1}, \quad \sqrt{2}\vec{\beta}_\lambda = \vec{\beta}_2 + i\lambda\beta_3, \lambda = 1, -1$$

Also the wave function which describes the motion of a free electron is explicitly written down.
When the problem is solved according to Dirac's theory (i.e. by taking electron spin into account), the aforementioned wave function Ψ will represent a four row matrix. However, when solving the problem of KLEIN-GORDON (i.e. in the case of spinless particles) it is necessary to confine oneself to two wave functions:
The expressions for the intensity of the particles with and without spin are explicitly written down. It is also shown how the polaritation effects are taken into account.
In the case of spinless particles radiation within the entire frequency interval is strictly linearly polarized. In the classical approximation ($\hbar = 0$) radiation in the case of

56-5-38/59

On the Theory of the Neutrino with Orientated Spin

$$(\hat{E} F m_0 c^2) \begin{pmatrix} \psi_{1,3} \\ \psi_{2,4} \end{pmatrix} = c(\sigma' \hat{p}) \begin{pmatrix} \psi_{3,1} \\ \psi_{4,2} \end{pmatrix}$$

Here $\hat{E}$ and $\hat{p}$ denote the energy operator and the momentum operator respectively and σ' - the double-row Pauli matrices. As the mass of the neutrino is equal to zero, the following linear relation between the functions $\begin{pmatrix} \psi_1 \\ \psi_2 \end{pmatrix} = \varepsilon \begin{pmatrix} \psi_3 \\ \psi_4 \end{pmatrix}$ is obtained.

Here $\varepsilon = \pm 1$ is true. Four different values may be chosen for ε, and to each of those values an individual physical significance may be attributed. The author here above all investigates the case $\varepsilon = E/|E|$, where the neutrino is a particle with positive energy and the antineutrino a hole in the background of the negative level. The corresponding Dirac equation and its solution are written down here. Next, expressions for the total energy $\bar{E}$, the total momentum $\vec{G}$ and the total projection $\bar{S}$ of the spin in the direction of motion are given. The neutrino and the antineutrino have a positive energy; the spin of the neutrino is parallel and the spin of the antineutrino is antiparallel to the momentum of this particle. There are 5 references, 2 of which are Slavic.

Card 2/3

Sokolov, A.A.

56-3-57/59

AUTHORS: Sokolov, A.A., Kerimov, B.K.

TITLE: The Influence Exercised by Damping in the Polarization of Dirac's Particles on the Occasion of Scattering (Vliyaniye zatukhaniya na polyarizatsiyu dirakovskikh chastits pri rasseyanii) (Letter to the Editor)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 3 (9), pp. 827 - 829 (USSR)

ABSTRACT: The elastic scattering of Dirac's particles and of the spinless particles by an immobile center of force were investigated by the authors in 4 previous papers by means of the theory of damping. The polarization occurring on the occasion of the elastic scattering of Dirac-particles is computed in the present paper by means of the theory of damping. The principal integral equation of the theory of damping for the determination of the scattering amplitudes $f'_{s'} \equiv f_{s'}(\vec{k}')$ has the form

$$(f'_{s'} - b'^{+}_{s'} b_s f_s) V^{\vec{k}'}_{\vec{K}'} = (kK/8\pi^2 c\hbar i) \sum_{s''} \oint d\Omega'' V^{\vec{k}''}_{\vec{k}'} V^{\vec{k}}_{\vec{k}''} b'^{+}_{s''} b''_{s''} f''_{s''} .$$

Here $E = ck$, K denotes the total energy of the particle and $V^{\vec{k}}_{\vec{k}'}$ - Fourier component of the potential energy

Card 1/3

56-3-57/59

The Influence Exercised by Damping in the Polarization of Dirac's Particles on the Occasion of Scattering

$V(r)$. The author confines himself to the computation of the polarization which occurs on the occasion of the elastic scattering of Dirac's particles for the potential $V(r) = V_0 \delta(\vec{r})$, $V^{\vec{k}}_{\vec{k}''} = V_0$. An ansatz is given for the solution of the above integral equation. Formulae are given for the amplitudes $f'_{s'}$ of the first scattering and then expressions for the amplitudes of the second scattering are determined. By means of these formulae a rather voluminous expression is obtained for the differential cross section of the two-fold scattering of the initially not polarized bundle of Dirac particles at the δ-potential. In first perturbational approximation no polarization occurs. Subsequently an expression for the degree of polarization within the domain of high energies is written down. Only the phase polarization occurring after the first scattering furnishes an asymmetry of secondary scattering. An expression in first approximation is given here for the cross section of the elastic scattering . There are 4 references, 2 of which are Slavic.

Card 2/3

Card 3/3

Sokolov, A. A. 20-6-13/47

AUTHORS: Sokolov, A. A., Ternov, I. M.,

TITLE: On the Quasiclassical Interpretation of the Quantum Effects in the Theory of the Emitting Electron (O kvaziklassicheskoy interpretatsii kvantovykh effektov v teorii svetyashchegosya elektrona)

PERIODICAL: Doklady AN SSSR, 1957, Vol. 117, Nr 6, pp. 967-970 (USSR)

ABSTRACT: The present paper gives a quasiclassical interpretation of those quantum effects which according to the quantum theory must occur in the motion of an ultrarelativistic electron in a magnetic field. First the classical equations for the motion of an ultrarelativistic electron in a synchrotron with the taking into account of the radiation are given. In linear approximation $\rho \sim R+qx$ is found for the radius of curvature. In this connection R signifies the radius of the instantaneous path of equilibrium, q - the exponent ($0 < q < 1$) characterizing the reduction of the magnetic field and $x = r - R$ is the coordinate of the betatron vibrations, where r signifies one of the cylindrical coordinates r, z, φ. Then in the linear approximation ofthe phase vibrations an expression is written down for the energy which the electron takes in the accelerating device. Then the initially mentioned classical equations are linearized. An equation for the radial betatron-vibrations is also derived. When a steady frictional force is intro-

Card 1/3

On the Quasiclassical Interpretation of the Quantum Effects in the Theory of the Emitting Electron. 20-6-13/47

duced into the theory of betatron vibrations the high damping coefficients must also be taken into account. An equation for the determination of the phase vibrations is written down. In the study of the emitting electron the influence of the factor of the discrete nature of the radiation must be taken into consideration. A fluctuation force for the descroption of the discrete nature of the radiation is introduced. One of the equations then derived characterizes the axial vibrations with consideration of the quantum fluctuations. The energy of the fluctuation radiation is proportional to ρ (and not to ρ^2 as in the classical case). But the transition probability also is inversely proportional to ρ. Therefore the classical formula is again obtained on transition to the steady radiation. In exactly the same manner the "High" coefficients of the damping by a transition to the limit from the quantum fluctuation forces to the steady radiation can be determined. A formula is given for the square of the amplitutde of the radial vibrations with consideration of the fluctuation force. Finally the synchrotron vibrations in the presence of quantum fluctuations are shrtly investigated. There are 8 references, 5 of which are Slavic.

Card 2/3

24(5) PHASE I BOOK EXPLOITATION SOV/1965

Sokolov, Arseniy Aleksandrovich

Vvedeniye v kvantovuyu elektrodinamiku (Introduction to Quantum Electrodynamics) Moscow, Fizmatgiz, 1958. 534 p. 10,000 copies printed.

Ed.: V.I. Rydnik; Tech. Ed.: S.N. Akhlamov.

PURPOSE: This book is intended for scientific workers, lecturers, graduate students (aspirants), and senior students in mathematics and physics who are interested in problems of modern quantum field theory.

COVERAGE: The book covers questions of the quantum electrodynamics of a free field, interaction of photons with electrons and positrons, theory of an electron-positron vacuum and other aspects of quantum electrodynamics, which are the most completely developed parts of quantum field theory. Considerable attention is given not only to a systematic presentation of general problems, but also to detailed

Card 1/14

89-4-4-17/23

AUTHOR: Sokolov, A.A.

TITLE: Comments on the Two-Component Neutrino Theory by Lee and Yang (Zamechaniya o dvukhkomponentnoy teorii neytrino Li i Yanga)

PERIODICAL: Atomnaya Energiya, 1958, Vol. 4, Nr 4, pp. 385-386 (USSR)

ABSTRACT: It is shown that the new neutrino theory ($k_o = 0$) can be developed also by using Dirac's equation with orientated spin. The results obtained by deriving this theory are then compared with that employed by Lee and Yang.
It is of interest to note that, if in a system of coordinates the double projection of neutrino spin upon the direction of motion is 1 ($s = 1$), the quantity s for a free particle in any other system of coordinates is also 1.
If the experiment for the antineutron furnishes a conception of symmetry perturbation that is contrary to the former, there is every reason to assume that the asymmetry of the world, seen as a whole, is due to the overwhelming majority of nucleons over antinucleons. There are 7 references, 3 of which are Soviet.

Card 1/2

.Comments on the Two-Component Neutrino Theory by Lee and Yang 89-4-4-17/28

SUBMITTED: January 16, 1958

1. Neutrinos--Theory

Card 2/2

29-4-4/20

AUTHOR: Sokolov, A., Professor MGU

TITLE: None Given

PERIODICAL: Tekhnika Molodezhi, 1958, Nr 4, pp. 6-6 (USSR)

ABSTRACT: Two fundamental discoveries in the field of theoretical physics were made in 1957. The first was made by the Chinese physicists Li-Chzhen-dao and Yan Chzhen'nin. They showed that with the beta decay of the nuclei, the number of electrons escaping in the direction of the nuclear spin, is smaller than that in the opposite direction (see Tekhnika Molodezhi, 1958,Nr 1). The second fundamental discovery was made by the well-known Soviet physicist Member of the Academy Nikolay Nikolayevich Bogolyubov He succeeded, together with his students, to enunciate the theory of superconductivity. The author now enumerates chronologically the most important elaborate investigations in this field. Finally, the author says, a complete theory of superconductivity was established. In reality N.N. Bogolyubov worked parallel with the American physicist Bardin, but independent from him. The idea of his work was to state both a physical and mathematical analogy of superconductivity and supervisco-

Card 1/2

None Given 29-4-4/20

sity. That signifies to find a correlation in the behaviour of the particles at low temperatures according to the statistics by Bose (helium atoms) and according to the statistics by Fermi (electrons). The scientific public appreciated the theoretical solution of the problem with recognition. The council of scientists at Moscow university unanimously conferred the award of the Lomonosov-price of 1st class for 1957 to N.N. Bogolyubov.

AVAILABLE: Library of Congress

1. Nuclei-Decay 2. Nuclear spins-Theory 3. Electrons-Motion 4. Superconductivity-Theory

Card 2/2

Card : 1/1

Electronic Analytical Balances

pointer is set at zero with the scale unloaded, by means of a potentiometer. The output current is set up 0.1 sec. after the weight is placed on the scale and the time needed for a weighing is the same as that required by the pointer of the device, that is measuring this current, to come to rest, i.e. from 1 to 2 seconds. The electronic balance draws about 30 watt. There are 2 tables, 1 schematic diagram, 1 circuit diagram, 1 photograph and 3 Soviet references.

Card 2/2

SOV/139-58-5-34/35

AUTHOR: Sokolov, A. A.

TITLE: Longitudinal Polarization of Dirac Particles and Parity Non-Conservation (Prodol'naya polyarizatsiya dirakovskikh chastits i nesokhraneniye chetnosti)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, fizika, 1958, Nr 5, pp 164-174 (USSR)

ABSTRACT: The paper opens with a recapitulation of the vector equation of motion for a free Dirac particle, which reads as follows:

$$(E - c(\vec{\alpha}\vec{p}) - \rho_3 m_0 c^2)\psi = 0 \qquad (1)$$

Here E is the operator $-\frac{\hbar}{i}\frac{\partial}{\partial t}$ and $\vec{p}$ is the operator $\frac{\hbar}{i}\nabla$; $\vec{\alpha}$ and ρ_3 are the standard Dirac matrice, m_0 is the particle rest-mass and c the light velocity and $\hbar = h/2\pi$, where h is Planck's constant. The properties of

Card 1/3

SOV/[illegible]-58-5-34/35

Longitudinal Polarization of Dirac Particles and Parity Non-Conservation

this vector equation under the following transformations are considered: $E \rightarrow E'$, $\underline{p} \rightarrow \underline{p}'$. It is shown that one can define a function $\psi' = \rho_3 \psi$ such that:

$$(E' - c(\underline{\alpha} , \underline{p}') - \rho_3 m_o c^2) \psi' = 0 \quad .$$

From this point on the discussion is concentrated on the longitudinal component of the vector equation, that is to say the component in the propagation direction. The properties of the longitudinal component of ψ' are compared in some detail with those of the original ψ for various Dirac particles (neutrinos, electrons, etc.) having various spins. A polarization vector for the longitudinal component is defined, and shown formally to obey the same matrix operator rules as the spin vectors. The contact transformation from ψ' to ψ does not in general leave parity unchanged; in fact it can be shown that parity conservation, if it occurs, must be accompanied by selection rules on the polarization operator. However, time reversal and change conservation, as would be expected, give no additional restrictions. A section of the

Card 2/3

SOV/139-58-5-34/35

Longitudinal Polarization of Dirac Particles and Parity Non-Conservation

paper is devoted to the explicit formulation of the 'longitudinal spin' operators for neutrino and antineutrino. The paper contains no figures or tables; there are 12 references, of which 1 is German, 1 Soviet, 1 Italian, 9 English.

ASSOCIATION: Moskovskiy ordena Lenina gosuniversitet imeni M. V. Lomonosova (Order of Lenin State University of Moscow imeni M. V. Lomonosov)

SUBMITTED: June 4, 1958.

Card 3/3

SOKOLOV, A. A., KERIMOV, B. K. and GUSEYNOV, I. I.

"Damping Theory Study of Elastic Scattering of Dirac Particles with Account of Polarization Effects," Nuclear Physics, Vol. 5, No. 2, Jan 1958 (North Halland Publ. Co., Amsterdam)

Physics Dept, Moscow State Univ, Moscow, USSSR

Abst. Elastic scattering of Dirac particles by a short-range force centre is considered from the standpoint of radiation damping theory. The expression for the scattering amplitude is determined. The integral equation thus obtained for the scattering amplitude permits one to investigate polarization effects.

SOKOLOV A A

56-1-17/56

AUTHORS: Sokolov, A. A. , Guseynov, I. I. , Kerimov, B. K.

TITLE: On the Scattering of Dirac Particles by a Short Range Force Centre According to the Damping Theory (K rasseyaniyu dirakovskikh chastits korotkodeystvuyushchim silovym tsentrom s uchetom zatukhaniya)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 110 - 112 (USSR)

ABSTRACT: In the present work the elastic scattering of Dirac particles by any short range force centre is investigated according to the damping theory. The wave functions are subdivided here according to the value of the projection of the spin onto the z-axis ($m_s = \pm 1/2$) and not according to the value of projection of the spin onto the direction of motion. The integral equation for this case is written down explicitly. A formula is also given for the matrix elements of the transitions on which occasion the spin proportion of the matrix element is given still more precisely. Moreover, the authors use various recurrence formulae. The expressions for the conponents of

Card 1/2

On the Scattering of Dirac Particles by a Short Range Force Centre According to the Damping Theory 56-1-17/56

the matrix element obtained after some further transformations are written down. It is possible to produce the orthogonal character of the matrix elements necessary for the damping theory. The thus found differential cross section of the elastic scattering and an expression for the amplitude of scattering are given. Concluding, the total cross section of the elastic scattering is written down. There is 1 reference, which is Slavic.

ASSOCIATION: Moscow State University
(Moskovskiy gosudarstvennyy universitet)

SUBMITTED: July 10, 1957

AVAILABLE: Library of Congress

Card 2/2

AUTHORS: Sokolov, A. A., Loskutov, Yu. M. 56-34-4-47/60

TITLE: On the Cherenkov Radiation of Longitudinal Polarized Electrons (O cherenkovskom izluchenii prodol'no poliarizovannykh elektronov)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki; 1958, Vol. 34, Nr 4, pp. 1022-1023 (USSR)

ABSTRACT: The present paper generalizes the results of a previous paper by the same author (Ref 3) dealing with the polarization properties of Cherenkov radiation for the case of longitudinal polarized electrons. For their calculations the authors used various formulae given in the book by A. A. Sokolov and D. D. Ivanenko (Ref 1).
Cherenkov radiation will consist of three parts:

$$W_{s\lambda} = (e^2/2c^2) \int_0^{\omega_{max}} w_{s\lambda}(\omega)d\omega = (e^2/2c^2) \int_0^{\omega_{max}} (w_{kl}(\omega) +$$

$$+ w_{quantized}(\omega) + s\lambda w_{longitudinal}(\omega))d\omega$$

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On the Cherankov Radiation of Longitudinal Polarized Electrons 56-34-4-47/60

where $w_{k.}(\omega) = \omega(1 - \cos^2\theta)$ denotes the (completely linearly polarized) classical part of the radiation; $w_{quantumlike}(\omega) = \hbar^2(n^2\omega^3/2c^2p^2)(1 - n^{-2})$ - the completely unpolarized quantumlike additional term; $w_{longitudinal}(\omega) = \hbar(n\omega^2/cp)(1 - (1/\beta n)\cos\theta)$ characterizes the longitudinal polarization of the photons. It is interesting that this part of the radiation is proportional not to $\hbar$ but to $\hbar^2$. The following formula holds for the degree of circular polarization: $P = (w_{+}(\omega) - w_{-}(\omega))/(w_{+}(\omega) + w_{-}(\omega)) \cong s(\hbar n\omega/cp)$. There are 4 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: January 18, 1958

Card 2/3

AUTHORS: Sokolov, A. A., Lysov, B. A. SOV/56-34-5-59/61

TITLE: Compton Scattering of Longitudinally Polarized Photons on Electrons with Oriented Spin (Komptonovskoye rasseyaniye prodol'no polyarizovannykh fotonov na elektronakh s oriyentirovannym spinom)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 5, pp 1351-1354 (USSR)

ABSTRACT: In connection with the discovery of the non-conservation of parity the further development of quantum-electrodynamics of electrons and photons with a longitudinal polarization is becoming a problem of topical interest. To consider the longitudinal polarization of the electrons in the computation of the matrix elements, not the formula by Casimir (Kazimir) but the formula (21,12) from the book by A.A. Sokolov and D.D. Ivanenko (Ref 3) has to be used, s denoting the eigenvalue of the operator ( )/i - ^{2}. This operator describes the double projection of the electron spin upon its direction of motion. This formula can be used in cases where the electron initially is at rest. For this case the formula is written down explicitly. Then an expression for the corresponding matrix element is given. From these expressions a generalization of the formula by Klein-Nishina

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SOV/56-34-5-59/61

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Compton Scattering of Longitudinally Polarized Photons on Electrons with Oriented Spin

(Kleyn-Nishina) can be derived. Starting with these expressions the formula by Klein-Nishina can be generalized to that case where the initial spin of the electron has the given orientation s and where the final spin states are summed up. In the scattering of a non-polarized radiation the orientation of the spin has no influence upon the integral law of scattering. A formula for the computation of the rate of the circular polarization of the scattered radiation is given. In the non-relativistic case there is obtained $P_{nonrelativistic} = 2 \cos$ $/(1 + \cos^2$). In the ultrarelativistic case the scattered radiation will, in the case of wide scattering angles, partly be circularly polarized. As inverse problem to the problem investigated above the two-photon annihilation of longitudinally polarized positrons on electrons at rest with a given spin direction is discussed. An expression for the corresponding cross-section is given. In the examined case a polarization and an azimuthal asymmetry exist. This makes possible to apply the two-photon annihilation of the positrons at oriented electrons for the experimental determination of the degree

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SOV/56-34-5-59/61

Compton Scattering of Longitudinally Polarized Photons on Electrons with Oriented Spin

of longitudinal polarization of positrons. There are 6 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: February 27, 1958

1. Photons--Scattering 2. Electrons--Properties 3. Nuclear spins 4. Mathematics--Applications

Card 3/3

SOV/20-122-5-1/56

AUTHORS: Arutyunyan, T.M., Mirzoyan, R.M., and Sokolov, A.A.

TITLE: Asymptotic Expression for the Degenerated Hypergeometric Function (Asimptoticheskoye vyrazheniye dlya vyrozhdennoy gipergeometricheskoy funktsii)

PERIODICAL: Doklady Akademii nauk, SSSR, 1958, Vol. 122, Nr 5, pp 751-754 (USSR)

ABSTRACT: The author studies the asymptotic behavior of the solutions of a differential equation of the form

$$u'' + f(x)u = 0 \qquad (1)$$

by constructing a "neighboring equation." The solution of equation (1) is sought in the form

$$u = \varphi(x)\, F[z(x)] \qquad (2)$$

where φ, F and z are arbitrary functions. Substituting (2) in (1), the asymptotic expression

$$u = (z/z')^{\frac{1}{2}} \left\{ AZ_s^{(1)} \quad BZ_s^{(2)} \right. (z) \left\{ \qquad (4)$$

Card 1/2

Asymptotic Expression for the Degenerated Hypergeometric Function

SOV/20-122-5-1/56

is obtained, where $Z_s^{(1)}$ and $Z_s^{(2)}$ are two linearly independent solutions of the Bessel equation and A and B are constants. The results are applied by the author to the location of asymptotic formulas for Whittaker's degenerate hypergeometric function $W_{\eta,\mu}(x)$ and to such special cases of this function as Hermitian and Laguerre polynomials and the Bessel function, and also to the derivation of Kelb's asymptotic formula. There are 7 references, 4 of which are Soviet, 2 American, and 1 German.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow State University imeni M.V. Lomonosov)

PRESENTED: June 2, 1958, by N.N. Bogolyubov, Academician

SUBMITTED: May 25, 1958

Card 2/2

PHASE I BOOK EXPOITATION SOV/3905

Filosofskiye voprosy yestestvoznaniya, [sbornik] II: Nekotoryye filosofsko-teoreticheskiye voprosy fiziki, matematiki i khimii (Philosophic Problems of Natural Science, [Collection of Articles] II: Philosophic and Theoretical Problems of Physics, Mathematics, and Chemistry) [Moscow] Izd-vo Mosk. univ-ta, 1959. 248 p. Errata slip inserted. 8,000 copies printed.

Editorial Board: K.A. Rybnikov, Kh.M. Fataliyev, and M.I. Shakhparonov; Eds.: R.A. Aronov, and A.A. Konoplyankin; Tech. Ed.: M.S. Yermakov.

PURPOSE: This book is intended for scientists interested in the history and philosophy of mathematics, physics, and chemistry.

COVERAGE: This is a second collection of articles prepared by the staff of the Department of Dialectical Materialism of the Moscow State University. The first collection was concerned with philosophical problems of the biological sciences, specifically Michurin's theories. The present collection consists of 14 articles divided by fields: physics, mathematics, and chemistry. The collection commemorates

Card 1/4

SOKOLOV, A. A.

"Theory of Dirac Particles with Oriented Spins and Parity Non-Conservation"
Nuclear Physics, 9, No. 3, Jan. 1959, 420-425 (North Holland Publishing Co., Amsterdam)

Abstract: The Lüders-Pauli theorem is investigated in connection with a type of theory chosen to describe Dirac particles with oriented spins.

Moscow State University

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SOV/139-59-3-20/29

AUTHORS: Sokolov, A.A., and Loskutov, Yu.M.

TITLE: On the Theory of Bosons and Fermions with Oriented Spin

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1959, Nr 3, pp 132-142 (USSR)

ABSTRACT: Lee and Yang (Ref 1) have predicted that in the case of weak interactions parity is not conserved. In phenomena involving the neutrino (fermions with zero rest mass) the nonconservation of parity may be explained with the aid of the two-component theory, or with the aid of the theory of Dirac particles with oriented spin (Refs 2, 3). In the latter case, and for positive energies ($\varepsilon = 1$, neutrino), it is necessary to retain the solution with one spin direction ($S_1 = S$), and for negative energies ($\varepsilon = -1$, antineutrino) with the other ($S_{-1} = -S$). This may be achieved if the wave function ψ satisfies both the Dirac equation and the additional condition given by Eq (1) (Ref 4), or $(\lambda - \rho_1)\psi = 0$ where $\lambda = \varepsilon$, $S_\varepsilon = 1$ (or -1) both for $\varepsilon = 1$ and $\varepsilon = -1$. The quantity $S_\varepsilon = S_{-\varepsilon}$ is proportional to the projection of spin onto the direction of the momentum p. In the present paper an attempt is made to generalize this result to particles

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S/055/59/000/04/006/026
B014/B005

AUTHORS: Sokolov, A. A., Muradyan, R. M., Arutyunyan, V. M.

TITLE: Development of the WKB Method of Approximation

PERIODICAL: Vestnik Moskovskogo universiteta. Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1959, Nr 4, pp 61 - 78 (USSR)

ABSTRACT: In mathematical physics, special functions which are exact solutions of differential equations are often approximated by simpler functions. The authors mention the method by Liouville-Steklov (Ref 1) for differential equations of second order, and then explain the method of approximation suggested by Wentzel, Kramers and Brillouin (Ref 3) (WKB method) for the solution of the wave equation. In this method, already the first approximation gives good results. In the present paper, this method is put forward in a generalized form. Besides, better approximated solutions are derived for a number of cases by finding the solution of a differential equation "neighboring" the original differential equation. In the first principal part of the present paper, the solutions (2,11) and (2,12) are obtained by the WKB method starting from the linear differential equation of second order u" + f(x)u = 0 (2,2). The first solution

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S/139/59/000/05/012/026
24.4500 E032/E114

AUTHORS: Sokolov, A.A., Ternov, I.M., and Loskutov, Yu.M.

TITLE: On the Transformation Properties of the Spin/9 Pseudovector

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1959, Nr 5, pp 72-80 (USSR)

ABSTRACT: Problems connected with the spin properties of particles have recently become more important in view of the discovery of the non-conservation of parity (Ref 1). The present paper introduces the 4-vector of polarisation of Dirac particles by a covariant method and investigates its transformation properties. The transformation law is shown to be of the form given by Eqs (14a-2). The results obtained from an analysis of the transformation properties are used in connection with phenomena in which parity is not conserved. In particular the $\pi\mu e$ decay is discussed and it is shown that in the laboratory system, the spin of the μ meson makes an angle α with the direction of its momentum which is given by Eq (21), where θ_μ is the angle of emission of the μ meson. The appearance of a transverse component of the μ meson spin in the laboratory system has also been considered by

Card 1/3

On the Transformation Properties of the Spin Pseudovector

Ascoli (Ref 9) but differs from Eq (21) by the factor given by Eq (23), which takes into account relativistic contraction of the transverse components of the spin. In fact, the axial spin vector characterises the circular polarisation in the plane perpendicular to its direction. For the longitudinal spin component this plane is perpendicular to the velocity of the particle and hence the polarisation remains unaltered. In the case of the transverse component, on the other hand, the velocity vector will lie in this plane and hence the polarisation will change. For particles with zero rest mass, the angle α vanishes, i.e. if the axial vector $\underline{s}$ is parallel to the momentum vector $\underline{k}$ in the given inertial frame, they will remain parallel in all other inertial frames. This can be used to characterise the neutrino and the anti-neutrino by different values of s, namely $s = -1$ and $s = +1$. If the polarisation of the neutrino is characterised by its helicity, i.e. by the rotation of the component of the vector $\underline{g}\psi$ which is perpendicular to the momentum, then in transforming

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S/055/59/000/06/07/027
B006/B005

AUTHORS: Sokolov, A. A., Muradyan, R. M., Arutyunyan, V. M.

TITLE: Development of an Approximate WKB Method

PERIODICAL: Vestnik Moskovskogo universiteta. Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1959, No. 6, pp. 64 - 86

TEXT: The present paper continues the first part published in "Vestnik Moskovskogo universiteta", 1959, No. 4, p. 61. It begins with § 4 dealing with the confluent hypergeometric function and deals at first with the Whittaker function. The formulas derived are subsequently applied to a concrete case: the investigation of the emission of an electron moving at ultrarelativistic velocity in a constant, homogeneous magnetic field. The problem is schematically shown by Fig. 1; Fig. 2 shows the dependence of radiation intensity on the number of harmonics. The subsequent chapters deal with the Laguerre and Hermite polynomials, the quantum correction in the theory of "radiating" electrons, and the determination of eigenvalues (the approximate method developed here does not only permit a derivation of asymptotic expressions for wave functions but also a determination of eigenvalues of the parameter λ - cf. Part I). The paper

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Development of an Approximate WKB Method

S/055/59/000/06/07/027
B006/B005

concludes with a comparison of the asymptotic formulas with the accurate formulas within the range of relatively small quantum numbers. (Abstracter's Note: Without knowing the first part of the paper it is not possible to follow the course of calculation, all the more so as all definitions necessary are missing.) There are 5 figures and 11 references, 9 of which are Soviet.

ASSOCIATION: Kafedra statisticheskoy fiziki i mekhaniki (Chair of Statistical Physics and Mechanics)

SUBMITTED: April 9, 1959

Card 2/2

SOKOLOV, A.A.; MURADYAN, R.M.; ARUTYUNYAN, V.M.

Development of the approximate method of Wentzel, Kramers, and Brillouin. Vest.Mosk.un.Ser.mat., mekh.astron.fiz.khim. 14 no.4:61-78 '59. (MIRA 13:8)

1. Kafedra statisticheskoy fiziki i mekhaniki Moskovskogo universiteta.
(Approximate computation)

24(5) SOV/56-36-2-37/63

AUTHORS: Sokolov, A. A., Arutyunyan, V. M., Muradyan, R. M.

TITLE: The Calculation of the Phases of Scattering Taking into Account the Second Approximation (Vychisleniye faz rasseyaniya s uchetom vtorogo priblizheniya)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 594 - 599 (USSR)

ABSTRACT: In the present paper the authors calculate the phase shifts of the elastic scattering of Dirac (Dirak) particles in second approximation with respect to the interaction potential. An expression is given for the general solution of the free Dirac equation of this problem. This solution is not limited by a condition of finiteness in the origin of coordinates. This solution of the free equation is also an asymptotic expression for the Dirac equation if there exists a spherically symmetric short-range force center. The next part of the paper gives an approximate solution of the Dirac equation for the case of a central field. An integral equation equivalent to the Dirac equation is given for the case in

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The Calculation of the Phases of Scattering Taking into Account the Second Approximation

SOV/56-36-2-37/63

which there is no vector potential and the scalar potential is spherically symmetric. The interaction energy is considered as a perturbation and the calculations are carried out in second approximation; the wave function corresponding to this approximation is given explicitly. The calculations are discussed step by step and the expressions found for the phase shifts are given explicitly. Neglecting the terms which are square with respect to $V(r)$, one obtains the same results as in the theory of damping for the scattering of Dirac particles. For small values of the scattering phases, the results of the first Born approximation are obtained. The results of this paper may be used also for the investigation of the scattering by a Coulomb (Kulon) center, $(V(r)=-Ze^2/r)$. The integral values of the phase shifts diverge in this case, but correct results are nevertheless found. Finally, expressions are given for the scattering amplitudes (in second approximation) and for the differential cross section. There are 4 references, 2 of which are Soviet.

Card 2/3

The Calculation of the phases of Scattering Taking into Account the Second Approximation SOV/56-36-2-37/63

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: August 26, 1958

Card 3/3

24(5) SOV/56-36-3-48/71

AUTHORS: Sokolov, A. A., Ternov, I. M., Loskutov, Yu. M.

TITLE: On the Problem of the Covariant Determination of the Spin Pseudovector (K voprosu o kovariantnom opredelenii psevdovektora spina)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 3, pp 930-932 (USSR)

ABSTRACT: The present paper ("Letter to the Editor") is based upon an earlier paper by Sokolov (Refs 1-3). It has already been shown that the longitudinal polarization of free Dirac particles can be described by the operator $(\vec{\sigma}\vec{k})/k$. This operator occurs as integral of motion with the eigen value "s". The authors endeavor to connect with the value "s" not only longitudinal polarization but also transversal polarization as well as the time component of the spin vector. Proceeding from the wave function for positive energy in consideration of the spin state equations are derived for the components of the spin vector. The transversal and the time component, which do not occur as integrals of motion, can be represented as mean value

$$\zeta_\mu = K \int \psi^+ \sigma_\mu \psi \, d^3x, \quad K = k_0 / \sqrt{1-\beta_1^2}$$

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On the Problem of the Covariant Determination of the Spin-pseudovector

It further holds that

$\xi_1 = k_o \sqrt{1-s^2} \cos\delta$, $\xi_2 = k_o \sqrt{1-s^2} \sin\delta$,

$\xi_3 = ks$, $\xi_4 = iks$; several special cases are investigated.

There are 7 references, 6 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: October 27, 1958

S/139/60/000/006/026/032
E032/E414

AUTHORS: Sokolov, A.A., Professor of Moscow State University, Stalin Prizewinner, Doctor of Physico-Mathematical Sciences, Vorob'yev, G.A., Docent and Moskalev, V.A., Docent

TITLE: On the 50th Anniversary of the Birthday of Aleksandr Akimovich Vorob'yev

PERIODICAL Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No.6, pp.161-164

TEXT: A.A.Vorob'yev was born in 1909. He attended the Tomsk State University between 1927 and 1931. In 1931, he graduated from the Division of Physics and Mechanics. In 1935, he produced a "brilliant dissertation" and became a senior scientific worker and Docent of the Tomsk State University in the Department of Experimental Physics. In 1936, A.A.Vorob'yev organized the High-Voltage Laboratory at the Siberian Physicotechnical Institute and became its head. In 1939, he successfully completed a dissertation submitted for the degree

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S/139/60/000/006/026/032
E032/E414

On the 50th Anniversary of the Birthday of
Aleksandr Akimovich Vorob'yev

development of new accelerator installations, including a new waveguide accelerator suggested by Vorob'yev which will be capable of producing very high energy electrons, although the overall dimensions of the installation and the high-frequency power consumption will be small. Results obtained in this direction were reported by Vorob'yev at the International Conference on High Energy Accelerators which was held in Geneva in 1959. In the fifties, Professor Vorob'yev also directed the research in the physics of solid dielectrics. Among Professor Vorob'yev's publications are: "Charged particle accelerators", "Electrical strength of solid dielectrics", "High-voltage technology", "Ultra-high voltages" and other monographs. Professor Vorob'yev is the author of some 200 scientific papers and 7 monographs and textbooks. He is a member of the Communist Party of the Soviet Union (since 1940) and has frequently been elected as a member of the local committees of the KPSU. In 1959, the citizens of Tomsk unanimously elected him as their

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